USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Illinois Agricultural Experiment Station

Soil Survey of Warren County, Illinois

How To Use This Soil Survey

General Soil Map

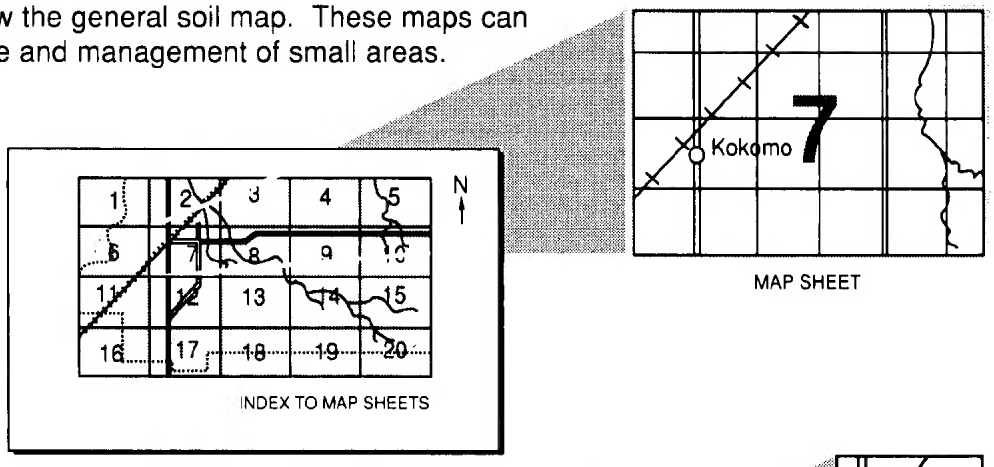
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

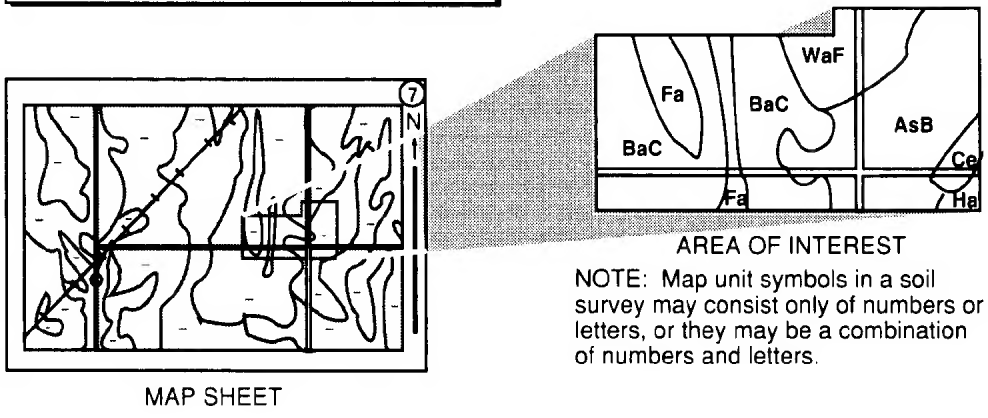
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1989. Soil names and descriptions were approved in 1990. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1989. This survey was made cooperatively by the Natural Resources Conservation Service and the Illinois Agricultural Experiment Station. It is part of the technical assistance furnished to the Warren County Soil and Water Conservation District. Financial assistance was provided by the Warren County Board and the Illinois Department of Agriculture.

This soil survey is Illinois Agricultural Experiment Station Soil Report 150.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An aerial view of Agricultural Experiment Station plots in an area of Tama, Muscatine, and Sable soils.

Contents

Issued 1998

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Warren County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Thomas W. Christensen
State Conservationist
Natural Resources Conservation Service

Soil Survey of Warren County, Illinois

By Steven Elmer, Natural Resources Conservation Service

Soils surveyed by Jeffrey Deniger and Steven Elmer, Natural Resources Conservation Service, and Doug Liniger, Warren County

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Illinois Agricultural Experiment Station

WARREN COUNTY is in northwestern Illinois (fig. 1). It has a total land area of 348,100 acres, or about 542 square miles. In 1980, the population of the county was 21,943 and that of Monmouth, the county seat, was 10,706.

This soil survey updates two earlier surveys of Warren County (Wascher and Smith, 1941; Reineback, 1970). It provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides general information about the county. It describes climate; history and development; farming; natural resources; and relief, physiography, and drainage.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Monmouth in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 26 degrees F and the average daily minimum temperature is 17 degrees. The lowest temperature on record, which occurred at Monmouth on February 3, 1996, is -24 degrees. In summer, the average temperature is 73 degrees and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred at Monmouth on July 15, 1936, is 110 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 37.11 inches. Of this, 23.6 inches, or 64 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 12.43 inches. The heaviest 1-day rainfall on record was 6.53 inches at Monmouth on July 15, 1929. Thunderstorms occur on about 47 days each year, and most occur in July.

The average seasonal snowfall is about 28 inches. The greatest snow depth at any one time during the period of record was 26 inches. On the average, 49 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 66 percent of the time possible in summer and 46 percent in winter. The prevailing wind is from the west-southwest. Average windspeed is highest, 12 miles per hour, in March and April.

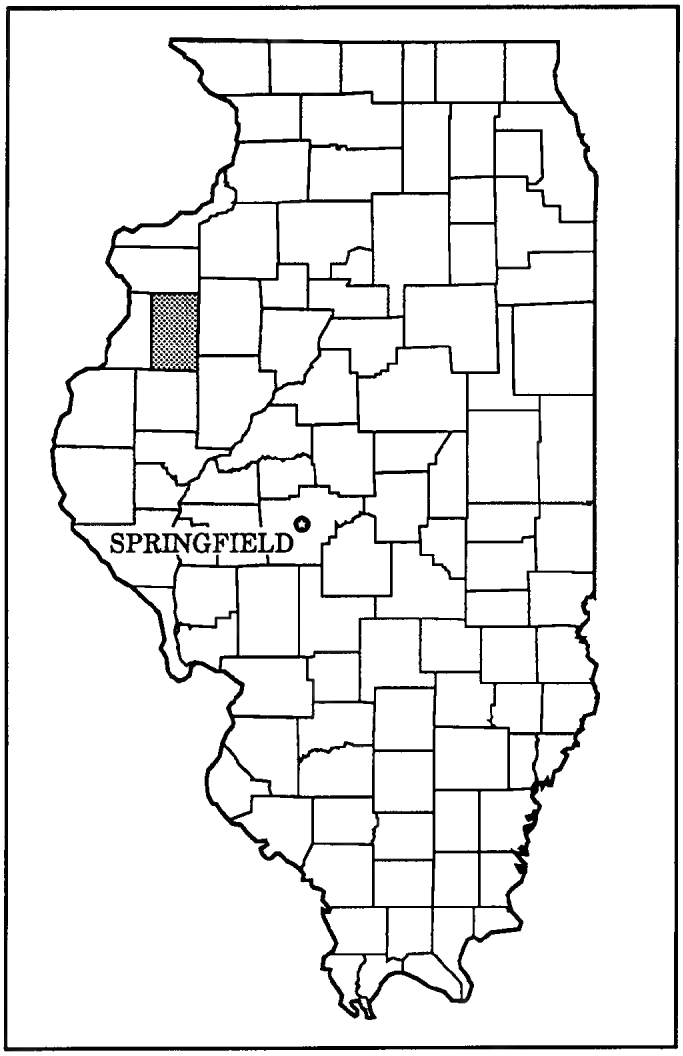


Figure 1.—Location of Warren County in Illinois.

History and Development

Several Indian tribes were the original inhabitants of the survey area. The Sauk and Fox tribes were the latest of these inhabitants. They retreated from the area after the Black Hawk War.

In 1812, the Military Tract was created by an act of Congress. Parcels of land lying within the boundaries of the Military Tract were used to reward veterans of the Revolutionary War and the War of 1812. Warren County was first created by an act of the General Assembly in 1825. It was named in honor of General Joseph Warren, the first officer to die in the Revolutionary War. Monmouth was chosen as the county seat in 1831. In 1841, as the result of a dispute regarding the location of the county seat, the original county was split into Warren and Henderson Counties.

The first pioneers arrived in the area in 1827. They settled near creeks and areas of timberland because of the availability of water and wood and the fear of prairie fires. They also used the land near the creeks for the production of crops for home use. The broad, flat prairies had poor drainage and were considered of little use for agriculture. This belief changed, however, with the invention of drainage tile in the 1860's.

Warren County agriculture grew with the opening of the first railroad in March of 1855. The railroads expanded the agricultural market, brought in lumber for better homes, and increased settlement. The invention and local production of horse-drawn farm implements further improved Warren County agriculture. Today, many of the area factories and businesses are still closely tied with agriculture.

Modern transportation systems in the county are well developed. There are four state highways, two U.S. highways, two railroad lines, one municipal airport, and numerous county roads.

Farming

The fertility of the soils in the county was recognized early in the 19th century. Corn, wheat, and oats were the most common crops grown by the early settlers. Much of the land was used as meadow and hayland for horses, cattle, mules, sheep, and hogs. The first fruit trees were planted in 1829 and bore fruit through 1867. A few scattered orchards remain in the county. The first 5 acres of corn was planted as early as 1828, and since then corn has been the most widely planted crop. An increase in the acreage used for soybeans and a decrease in livestock populations have reduced the acreage used for many of the small grain and forage crops (U.S. Department of Commerce, 1983). The abundance of corn-fed cattle in the county led to Monmouth's recognition as the prime beef capital of the world. In more recent years, growing corn for seed has become popular.

Natural Resources

Soil is the chief natural resource in Warren County. Most of the soils are nearly level to sloping and formed in medium textured material under tall prairie grasses. Combined with a favorable climate, these factors result in highly productive farmland. Corn and soybeans are the major crops. Secondary farm products include wheat, oats, hay, cattle, hogs, fruit, and vegetables.

Woodland covers about 15,000 acres in the county (U.S. Department of Commerce, 1983). Much of this acreage is unimproved land along the major

drainageways. Wildlife generally is scarce, except in areas where suitable habitat is available. There are no natural lakes in Warren County, but more than 600 acres of manmade lakes and ponds and about 140 miles of streams provide fishing and other recreational opportunities. Sunfish, crappie, bluegill, catfish, bass, and other fish inhabit these waters.

Subsurface natural resources in the county include water, sand, limestone, coal, and clay. Scattered deposits of water-bearing sand and gravel are in the glacial till that underlies much of Warren County. Where suitable sand and gravel deposits are not available, ground water must be obtained from the underlying bedrock. Most rural wells in the county obtain water from sandstones in the Pennsylvanian formations, from the Keokuk-Burlington limestone, or from the Silurian dolomite. Municipal and industrial water supplies are obtained from deep bedrock aquifers, including the Glenwood-St. Peter and Ironton-Galesville sandstones (Brueckman and Bergstrom, 1968).

Sand deposits, which occur in scattered pockets on upland hillsides along some of the major drainageways, are good sources of road material, building material, and fill material. The most extensive of these areas are along Picayune Creek in Berwick Township, Swan Creek in Greenbush Township, and Henderson Creek in Sumner Township. Limestone is a valuable mineral mined in Warren County. The limestone is of Mississippian age and occurs as outcrops along Cedar Creek and its tributaries in the northwestern part of the county and along Cedar Fork in the eastern part of Berwick Township. Open pit quarries in both of these areas are currently active. The limestone is used for concrete aggregate, agricultural lime, building stone, and crushed stone.

In the past, coal was mined for local use and tile clay was used for sewer and drainage tile and pottery. Three coal seams, ranging from 18 to 48 inches in thickness, were mined in the county. The coal mines were generally small and employed from one to twenty miners. Many mines were in outcrop areas along drainageways in the eastern part of the county. The discovery of clay near Monmouth and the development of the use of the clay as drainage tile were important influences on Warren County agriculture. Much of the clay was also used for sewer pipe, bricks, or pottery.

Relief, Physiography, and Drainage

Ken Russell, fishery biologist, Illinois Department of Conservation, helped prepare this section.

The landscape of Warren County has been shaped mainly by glacial ice, by running water, and by wind action. Through the centuries these natural forces have resulted in a landscape characterized by topographic diversity. The prevailing topography is essentially that of a nearly level plain that has been fairly well dissected by the headwater erosion of numerous small streams and drainageways (fig. 2). A major watershed divide occurs in the county. The streams in the northern and western areas flow to the Mississippi River, and those in the east and southeast drain into the Illinois River. The streams that flow west towards the Mississippi River include Henderson, Cedar, Ellison, and Honey Creeks. Cedar Fork, Negro Creek, and Swan Creek flow eastward towards the Illinois River. In the northern and extreme southern parts of the county are remnants of a few distinct ridges that are not directly related to stream erosion.

Much of the northwestern and southeastern portions of Warren County are so strongly dissected with small drainageways that little of the original nearly level plain remains. Surface drainage is fairly rapid in these areas, and artificial drainage plays a minor role in the removal of excess water. In the central part of the county and, particularly, in the southwestern part are many areas of nearly level land. Artificial drainage is needed if these areas are to be used for agricultural purposes. The lowest land points in Warren County, 579 feet above sea level, are in areas of bottom land along Henderson and Cedar Creeks at the Henderson County border. The highest elevation, 801 feet, is in the southwest corner of Point Pleasant Township. Thus, the elevation in the county varies by 222 feet.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils

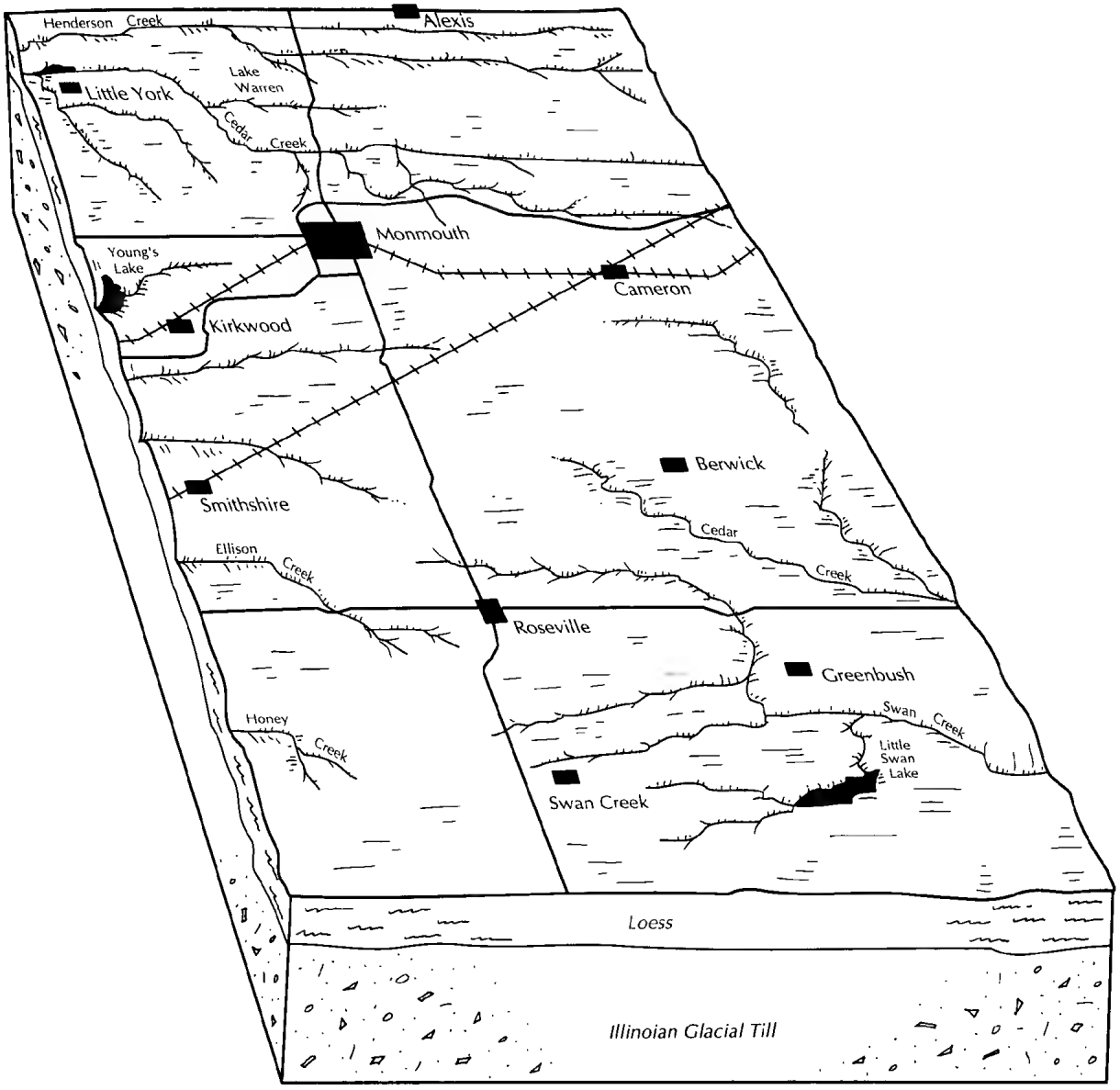


Figure 2.—Topography of Warren County, Illinois.

in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are

concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The soil maps of this survey join the soil maps of the surveys of Henderson, Mercer, and McDonough Counties. Also, in Warren County the Rozetta-Hickory-Elco association on the general soil map joins the Hickory-Marseilles and Rozetta-Elco-Clarksdale associations on the general soil map of Knox County. The landscapes are similar in both counties, and the Marseilles soils occur as soils of minor extent in the Rozetta-Hickory-Elco association in Warren County. The Radford-Sawmill-Lawson association in Warren County joins a similar association (Huntsville-Littleton) in Henderson County. Huntsville soils occur as inclusions with the Lawson soils, and Littleton soils are of minor extent in the Warren County association. The names of some of the soils on the maps of Warren County may differ slightly from those on the maps of Henderson, Knox, McDonough, and Mercer Counties because of differences in the extent of the soils in each county. Though the names vary slightly, the associations in the different counties represent similar landscape units that have similar soil properties and similar management requirements.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way

diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Ipava-Sable Association

Nearly level and gently sloping, somewhat poorly drained and poorly drained, moderately slowly permeable and moderately permeable soils that formed in loess; on uplands

This association consists of soils on wide ridges and broad flats in the uplands. Slopes range from 0 to 4 percent.

This association makes up about 2 percent of the county. It is about 48 percent Ipava soils, 30 percent Sable soils, and 22 percent soils of minor extent.

Ipava soils are on wide ridges and side slopes. They are somewhat poorly drained and are moderately slowly permeable. Typically, the surface layer is very dark brown silt loam about 11 inches thick. The subsurface layer is very dark brown silty clay loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is mixed brown and dark grayish brown silty clay loam, the next part is brown silty clay, and the lower part is light brownish gray silty clay loam.

Sable soils are on broad flats and in shallow depressions. They are poorly drained and are moderately permeable. Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is black and very dark gray silty clay loam about 15 inches thick. The subsoil is about 24 inches thick. It is mottled. The upper part is dark gray silty clay loam, the next part is grayish brown silty clay loam, and the lower part is gray silt loam. The substratum to a depth of 60 inches or more is gray, mottled silt loam.

Of minor extent in this association are Denny and Tama soils. The poorly drained Denny soils are in shallow depressions. The well drained and moderately well drained Tama soils are along drainageways and on convex ridgetops.

Most of this association is used for cultivated crops. The soils are well suited to all of the crops commonly grown in the county. The main management needs are measures that maintain an adequate drainage system, maintain fertility, and improve tilth.

2. Ipava-Tama Association

Nearly level to strongly sloping, well drained to somewhat poorly drained, moderately permeable and moderately slowly permeable soils that formed in loess; on uplands

This association consists of soils on ridges and side slopes. Slopes are generally long and smooth, but they are more irregular along drainageways. They range from 0 to 15 percent.

This association makes up about 7 percent of the county. It is about 45 percent Ipava soils, 42 percent Tama soils, and 13 percent soils of minor extent (fig. 3).

Ipava soils are nearly level and gently sloping. They are on flats and long side slopes, are moderately slowly permeable, and are somewhat poorly drained. Typically, the surface layer is very dark brown silt loam about 11 inches thick. The subsurface layer is very dark brown silty clay loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is mixed brown and dark grayish brown

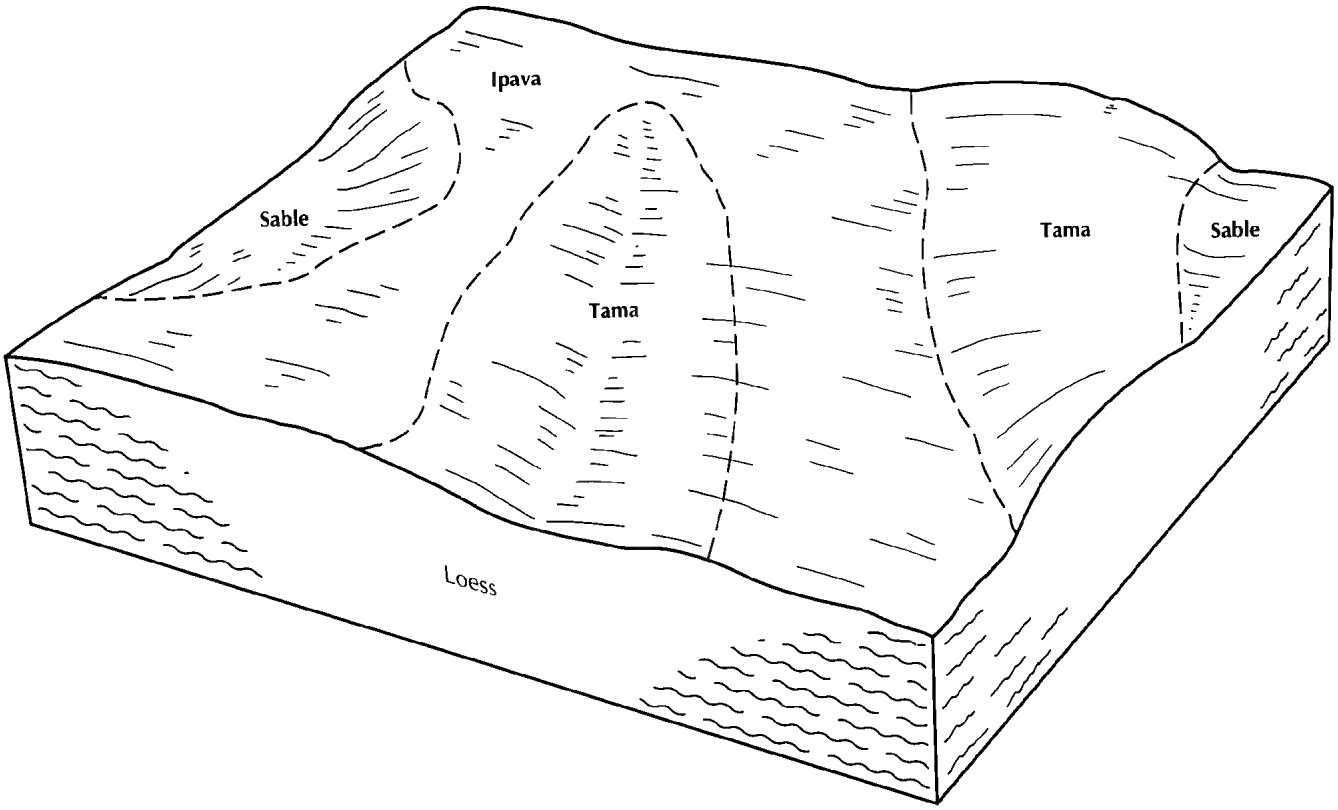


Figure 3.—Typical pattern of soils and parent material in the Ipava-Tama association.

silty clay loam, the next part is brown silty clay, and the lower part is light brownish gray silty clay loam.

Tama soils are gently sloping to strongly sloping. They are on ridges and on side slopes along drainageways. They are moderately permeable and are well drained and moderately well drained. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark brown silt loam about 7 inches thick. The subsoil to a depth of 60 inches or more is silty clay loam. The upper part is brown, the next part is yellowish brown, and the lower part is yellowish brown and is mottled.

Of minor extent in this association are Assumption, Denny, and Sable soils. The moderately well drained Assumption soils are in moderately sloping and strongly sloping areas along drainageways. Denny and Sable soils are poorly drained. Denny soils are in shallow depressions. Sable soils are on broad flats or in shallow depressions.

Most of this association is used for cultivated crops. The soils are well suited to all of the crops commonly grown in the county. The main management needs are measures that maintain the drainage system on the flats and that control erosion on the slopes.

3. Sable-Muscatine Association

Nearly level, somewhat poorly drained and poorly drained, moderately permeable soils that formed in loess; on uplands

This association consists of soils on wide ridges and broad flats or in shallow depressions in the uplands. Slopes range from 0 to 2 percent.

This association makes up about 15 percent of the county. It is about 49 percent Sable soils, 34 percent Muscatine soils, and 17 percent soils of minor extent.

Sable soils are on broad flats or in shallow depressions. They are poorly drained. Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is black and very dark gray silty clay loam about 15 inches thick. The subsoil is about 24 inches thick. It is mottled. The upper part is dark gray silty clay loam, the next part is grayish brown silty clay loam, and the lower part is gray silt loam. The substratum to a depth of 60 inches or more is light gray, mottled silt loam.

Muscatine soils are on the higher parts of the landscape. They are somewhat poorly drained. Typically, the surface layer is very dark brown silt loam

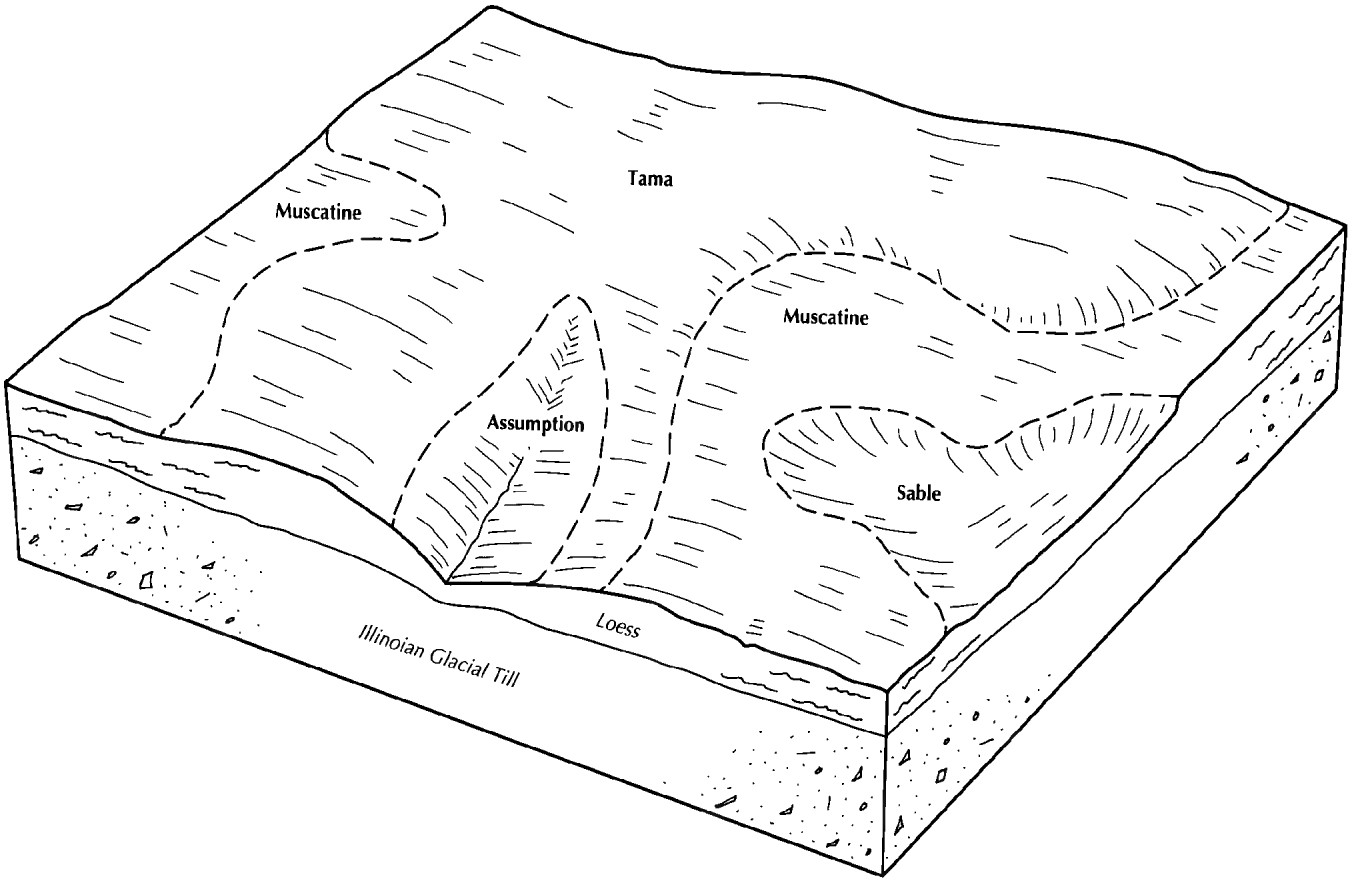


Figure 4.—Typical pattern of soils and parent material in the Tama-Muscatine association.

about 11 inches thick. The subsurface layer also is very dark brown silt loam. It is about 7 inches thick. The subsoil is silty clay loam about 38 inches thick. The upper part is mixed very dark grayish brown and grayish brown, the next part is dark grayish brown and grayish brown and is mottled, and the lower part is light brownish gray and is mottled. The substratum to a depth of 60 inches or more is light brownish gray, mottled silt loam.

Of minor extent in this association are Denny, Harpster, and Tama soils. Denny and Harpster soils are poorly drained. Denny soils are in shallow depressions. Harpster soils are on broad flats or in shallow depressions. The well drained and moderately well drained Tama soils are along drainageways and on convex ridgetops.

Most of this association is used for cultivated crops. The soils are well suited to all of the crops commonly grown in the county. The main management needs are measures that maintain the drainage system, maintain fertility, and improve tilth.

4. Tama-Muscatine Association

Nearly level to strongly sloping, well drained to somewhat poorly drained, moderately permeable soils that formed in loess; on uplands

This association consists of soils on ridges, side slopes, and flats. Slopes range from 0 to 15 percent.

This association makes up about 42 percent of the county. It is about 50 percent Tama soils, 30 percent Muscatine soils, and 20 percent soils of minor extent (fig. 4).

Tama soils are gently sloping to strongly sloping and are on ridges and on side slopes along drainageways. They are well drained and moderately well drained. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark brown silt loam about 7 inches thick. The subsoil to a depth of 60 inches or more is silty clay loam. The upper part is brown, the next part is yellowish brown, and the lower part is yellowish brown and is mottled.

Muscatine soils are nearly level and are on ridgetops

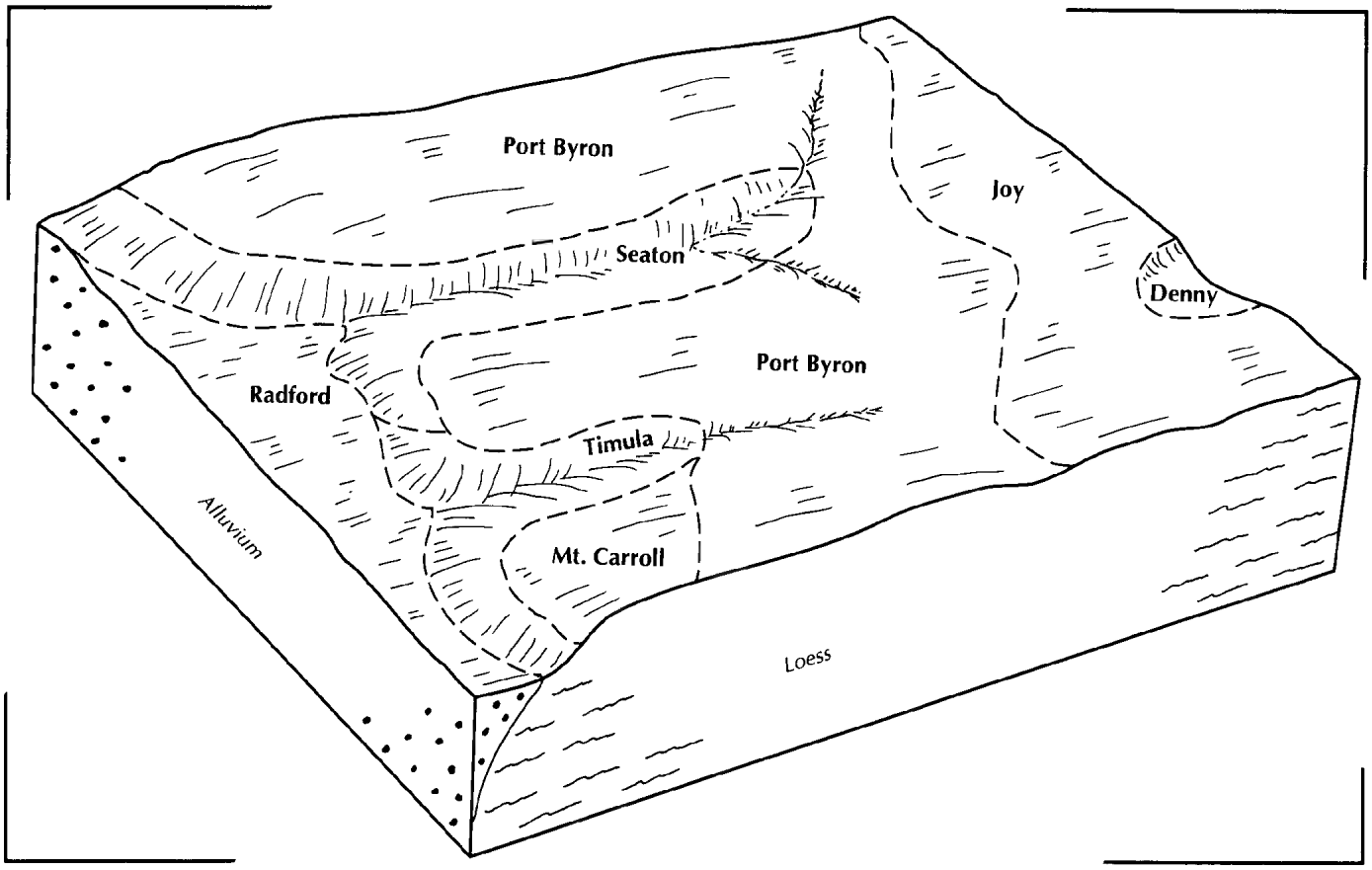


Figure 5.—Typical pattern of soils and parent material in the Port Byron-Joy-Seaton association.

and flats near the heads of drainageways. They are somewhat poorly drained. Typically, the surface layer is very dark brown silt loam about 11 inches thick. The subsurface layer also is very dark brown silt loam. It is about 7 inches thick. The subsoil is silty clay loam about 38 inches thick. The upper part is mixed very dark grayish brown and grayish brown, the next part is grayish brown and is mottled, and the lower part is light brownish gray and is mottled. The substratum to a depth of 60 inches or more is light brownish gray, mottled silt loam.

Of minor extent in this association are Assumption, Downs, and Sable soils. The moderately well drained Assumption soils are in moderately sloping and strongly sloping areas along drainageways. The moderately well drained Downs soils are on ridges and side slopes near the Tama soils. The poorly drained Sable soils are on broad flats or in shallow depressions.

Most of this association is used for cultivated crops. The soils are well suited to all of the crops commonly grown in the county. The main management needs are measures that maintain the drainage system on the flats and that control erosion on the slopes.

5. Port Byron-Joy-Seaton Association

Nearly level to strongly sloping, well drained to somewhat poorly drained, moderately permeable soils that formed in loess; on uplands

This association consists of soils on ridges, side slopes, and flats. Slopes range from 0 to 15 percent.

This association makes up about 2 percent of the county. It is about 55 percent Port Byron soils, 15 percent Joy soils, 11 percent Seaton soils, and 19 percent soils of minor extent (fig. 5).

Port Byron soils are gently sloping and moderately sloping. They are on ridges and side slopes along drainageways and are moderately well drained. Typically, the surface layer is very dark brown silt loam about 11 inches thick. The subsoil to a depth of 60 inches or more is silt loam. The upper part is mixed dark brown and very dark brown; the next part is brown, dark yellowish brown, and yellowish brown; and the lower part is yellowish brown and is mottled.

Joy soils are nearly level. They are on wide ridges and flats and are somewhat poorly drained. Typically, the surface layer is black silt loam about 13 inches thick. The subsurface layer also is black silt loam. It is about 6 inches thick. The subsoil is silt loam about 35 inches thick. It is mottled. The upper part is mixed brown and grayish brown, and the lower part is grayish brown. The substratum to a depth of 60 inches or more is light brownish gray, mottled silt loam.

Seaton soils are moderately sloping and strongly sloping. They are on side slopes and are well drained. Typically, the surface layer is mixed dark grayish brown and yellowish brown silt loam about 8 inches thick. The subsoil to a depth of 60 inches or more is silt loam. The upper part is mixed brown and yellowish brown, the next part is yellowish brown, and the lower part is yellowish brown and light yellowish brown and is mottled.

Of minor extent in this association are Denny, Mt. Carroll, Radford, and Timula soils. The poorly drained Denny soils are in shallow depressions. The moderately well drained Mt. Carroll soils are in landscape positions similar to those of the Port Byron soils. They have a thinner surface layer than the Port Byron soils. The somewhat poorly drained Radford soils are in drainageways below the major soils. The well drained Timula soils are in landscape positions similar to those of the Seaton soils.

Most of this association is used for cultivated crops. The soils are moderately suited or well suited to all of the crops commonly grown in the county. The main management needs are measures that control erosion on the slopes and that maintain the drainage system on the flats.

6. Rozetta-Hickory-Elco Association

Gently sloping to very steep, moderately well drained and well drained, moderately permeable and moderately slowly permeable soils that formed in loess or glacial till or in loess and glacial till; on uplands

This association consists of soils on dissected ridges and side slopes. Slopes range from 2 to 50 percent.

This association makes up about 28 percent of the county. It is about 38 percent Rozetta and similar soils, 19 percent Hickory soils, 10 percent Elco soils, and 33 percent soils of minor extent (fig. 6).

Rozetta soils are gently sloping and moderately sloping. They are on ridges and on the upper parts of side slopes along drainageways. They are moderately well drained. Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown silt loam, the next part is yellowish brown silty clay loam, and the lower part is yellowish brown silty clay loam and is mottled.

Hickory soils are strongly sloping to very steep. They are on side slopes and are well drained. Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is mixed dark grayish brown and brown silt loam about 5 inches thick. The subsoil is clay loam about 46 inches thick. The upper part is dark yellowish brown, the next part is yellowish brown and is mottled, and the lower part is light olive brown and is mottled. The substratum to a depth of 60 inches or more is yellowish brown, mottled clay loam.

Elco soils are strongly sloping and moderately steep. They are on side slopes and are moderately well drained. Typically, the surface layer is mixed dark grayish brown and brown silt loam about 7 inches thick. It has been thinned by erosion. The subsurface layer is brown silt loam about 4 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown silty clay loam, the next part is yellowish brown silty clay loam, and the lower part is olive brown, mottled clay.

Of minor extent in this association are Downs, Marseilles, and Orion soils. The moderately well drained Downs soils are in positions on the ridges and side slopes similar to those of the Rozetta soils. The moderately well drained Marseilles soils formed in material weathered from shale and siltstone. They are on side slopes below the Hickory soils. The somewhat poorly drained Orion soils are in drainageways below the major soils.

Most of this association is used for cultivated crops, pasture, or hay. The steeper areas, however, are used mainly as woodland or for woodland wildlife habitat. Erosion is the major hazard on these soils. Measures that control erosion, maintain fertility and the organic matter content, and improve tilth are needed.

7. Radford-Sawmill-Lawson Association

Nearly level, somewhat poorly drained and poorly drained, moderately permeable soils that formed in alluvium; on flood plains

This association is on broad flood plains along major streams. Slopes range from 0 to 2 percent.

This association makes up about 4 percent of the county. It is about 37 percent Radford and similar soils, 30 percent Sawmill and similar soils, 24 percent Lawsor soils, and 9 percent soils of minor extent (fig. 7).

Radford soils are somewhat poorly drained. Typically the surface layer is very dark gray silt loam about 7 inches thick. The subsurface layer is very dark gray silt loam about 5 inches thick. The substratum is stratified

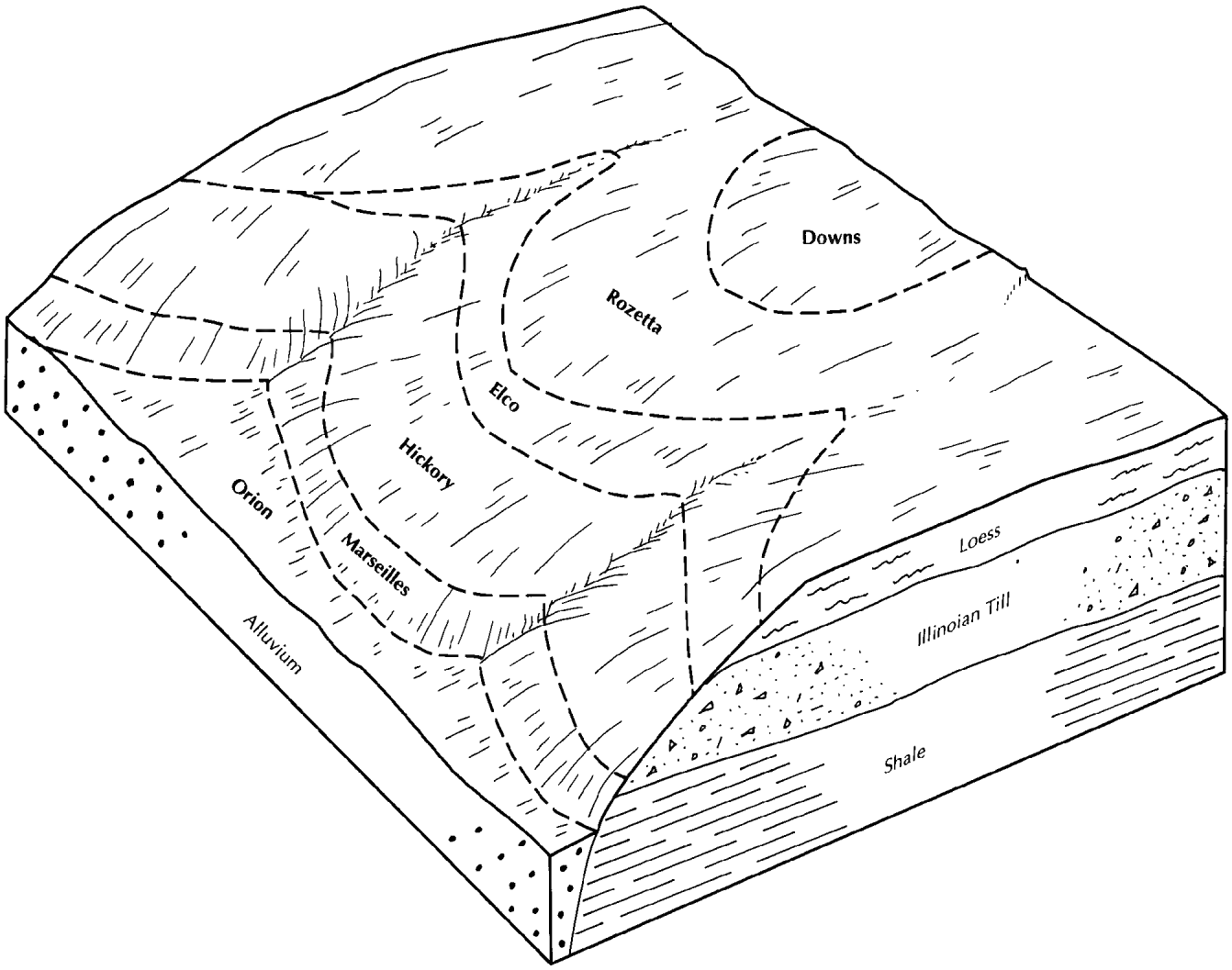


Figure 6.—Typical pattern of soils and parent material in the Rozetta-Hickory-Elco association.

very dark grayish brown, very dark gray, grayish brown, and brown, mottled silt loam about 20 inches thick. Below this to a depth of 60 inches or more is a buried soil of silty clay loam. The upper part is black, and the lower part is mixed very dark gray and dark grayish brown.

Sawmill soils are poorly drained. Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsurface layer is very dark gray, mottled silty clay loam about 21 inches thick. The subsoil is silty clay loam about 15 inches thick. It is mottled. The upper part is dark gray, and the lower part is mixed grayish brown and dark grayish brown. The substratum to a depth of 60 inches or more is grayish brown, mottled silty clay loam.

Lawson soils are somewhat poorly drained. Typically, the surface layer is black silt loam about 7 inches thick. The subsurface layer is black and very dark gray silt loam about 23 inches thick. The substratum to a depth of 60 inches or more is silt loam. It is mottled. The upper part is stratified very dark gray, very dark grayish brown, and dark grayish brown. The lower part is dark grayish brown.

Of minor extent in this association are Littleton, Orion, and Raddle soils. The somewhat poorly drained Littleton soils are on terraces above the major soils. The somewhat poorly drained Orion soils are along drainageways and on flood plains. The well drained Raddle soils are on terraces above the major soils.

Most of this association is used for cultivated crops, pasture, or hay. The main management needs are measures that protect the crops from floodwater,

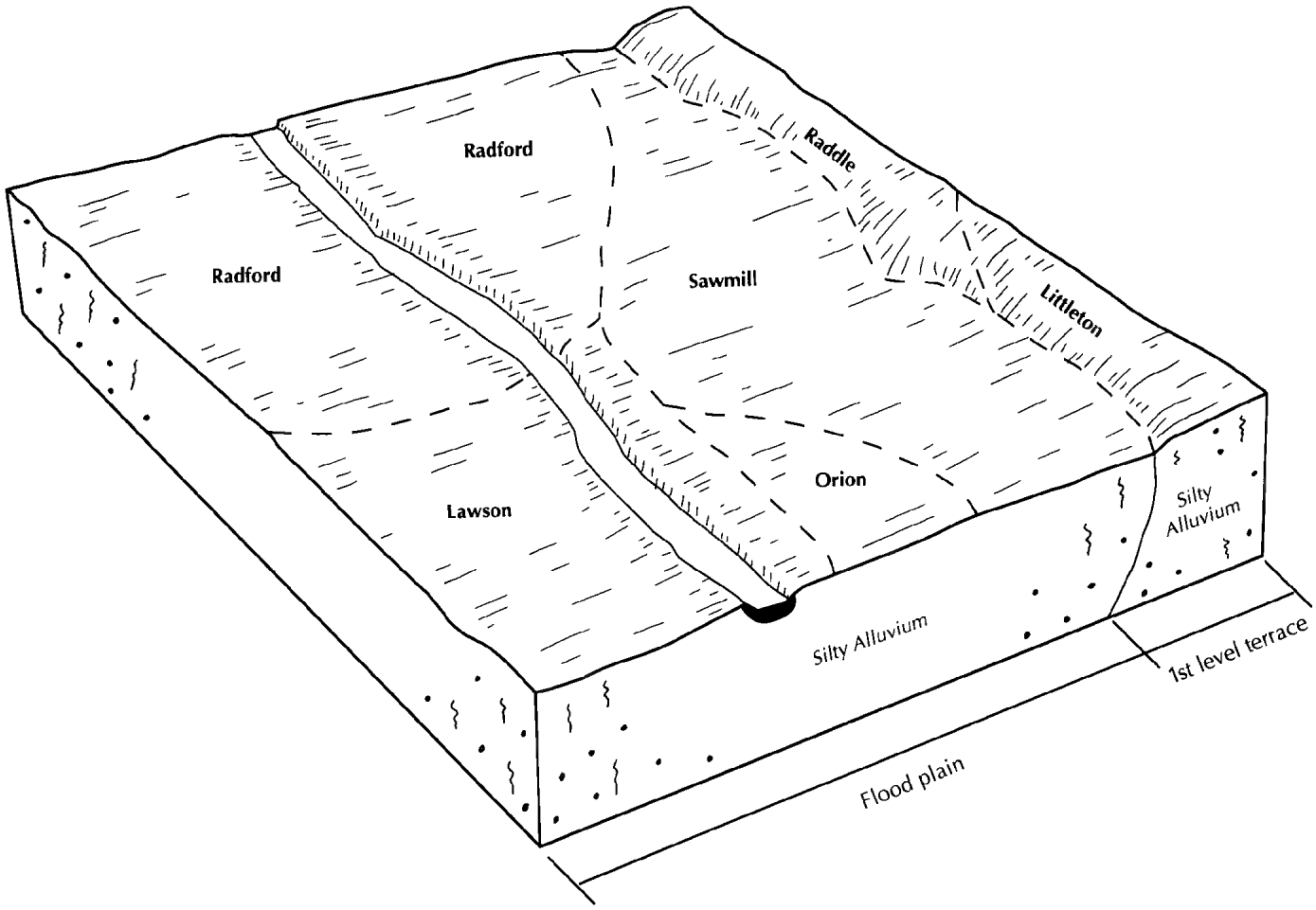


Figure 7.—Typical pattern of soils and parent material in the Radford-Sawmill-Lawson association.

maintain fertility, and improve drainage and tilth.

Broad Land Use Considerations

The soils in Warren County vary widely in their suitability for major land uses. About 80 percent of the land in the county is used for cultivated crops, mainly corn and soybeans. All of the associations are used as cropland. Associations 1, 2, 3, 4, 5, and 7 are generally well suited to cultivated crops if proper management is applied. The hazard of erosion and the seasonal high water table are the main limitations affecting crops. Flooding is also a hazard on the soils in association 7. The major soils in association 6 differ widely in their suitability for crops. Rozetta soils range from well suited to poorly suited. Hickory soils are poorly suited or are generally unsuited. Elco soils range from moderately suited to poorly suited. Erosion is a hazard, and the slope is a limitation.

About 10 percent of the county, mainly in associations 6 and 7, is used as hayland, pasture, or woodland. The major soils in these associations are Hickory, Lawson, Radford, Rozetta, and Sawmill soils. These soils are generally moderately suited to hay and pasture. The Hickory soils in association 6 are poorly suited or are generally unsuited to these uses because of the erosion hazard and the slope. The soils in associations 6 and 7 are well suited to moderately suited to woodland. Soils in association 6 are susceptible to erosion, and the slope is a limitation. Soils in association 7 are subject to flooding.

A few areas, primarily in associations 4 and 6, are used for urban development. In general, the soils in association 5 have the best suitability for urban uses. In other associations, frost action, wetness, and the slope are the major limitations. Soils in association 7 are poorly suited to urban development because of the flooding. The steeper areas in association 6 are poorly

suited because of the slope. Sites that are suitable for houses or small commercial buildings, however, are generally available within these areas.

Potential for recreational uses ranges from good to poor, depending upon the intensity of use. Associations 5 and 6 generally have good potential for intensive recreational development. In the steeper areas, however, the slope is a limitation. Association 7 has poor potential because of the flooding. All of these associations are suitable for hiking or horseback riding. Small areas suitable for intensive development, such as playgrounds and campsites, are commonly available within associations that generally have poor potential.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Tama silt loam, 5 to 10 percent slopes, eroded, is a phase of the Tama series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Fayette-Hickory complex, 10 to 18 percent slopes, eroded, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Pits, quarries, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

7D3—Atlas silty clay loam, 10 to 18 percent slopes, severely eroded

Composition

Atlas and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform position: Side slopes along drainageways
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Very slow
Parent material: Glacial till
Runoff: Rapid
Available water capacity: Moderate
Seasonal high water table: Perched at a depth of 1 to 2 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—brown silty clay loam

Subsoil:
8 to 15 inches—brown clay loam
15 to 45 inches—grayish brown and dark grayish brown, mottled clay

Substratum:
45 to 60 inches—dark grayish brown, mottled clay loam

Inclusions

Contrasting inclusions:
- Orion soils on flood plains
- Small, isolated areas of sandy outwash

Similar soils:
- Soils that formed in loamy glacial till
- Soils that formed in loess and glacial till
- Soils that have slopes of less than 10 percent

Use and Management

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
- Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
- Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
- Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Seedling mortality, equipment limitations, and erosion
Management measures:
- Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
- In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
- The woodland should be protected from fire and from grazing by livestock.

Wildlife habitat

Management concerns: None
Management measures:
- The habitat should be protected from fire and from overgrazing by livestock.

Dwellings

Management concerns: Wetness and the shrink-swell potential
Management measures:
- Land shaping by cutting and filling helps to overcome the slope.
- Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
- Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness and the very slow permeability
Management measures:
- Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
- Installing filter lines on the contour helps to distribute the effluent evenly.
- Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 4C

8D2—Hickory silt loam, 10 to 18 percent slopes, eroded

Composition

Hickory and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess and glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown silt loam
Subsurface layer:
6 to 9 inches—dark yellowish brown silty clay loam
Subsoil:
9 to 16 inches—dark yellowish brown clay loam
16 to 35 inches—yellowish brown clay loam
35 to 51 inches—light yellowish brown and dark yellowish brown, mottled clay loam
Substratum:
51 to 60 inches—yellowish brown, mottled clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils on the upper side slopes
• The moderately well drained Marseilles soils on the lower side slopes or in positions similar to those of the Hickory soil
• Small, isolated areas of sandy outwash
Similar soils:
• Soils that have more clay or less sand in the subsoil
• Soils that have a darker surface layer or a surface layer of loam

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential and the slope
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Woodland

Management concerns: Plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Septic tank absorption fields

Management concerns: The slope and the moderate permeability
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 5A

8D3—Hickory clay loam, 10 to 18 percent slopes, severely eroded

Composition

Hickory and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High

Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 6 inches—mixed dark yellowish brown and brown clay loam

Subsoil:
6 to 44 inches—yellowish brown clay loam

Substratum:
44 to 60 inches—yellowish brown and mixed brown and yellowish brown clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils on the upper side slopes
• The moderately well drained Marseilles soils on the lower side slopes or in landscape positions similar to those of the Hickory soil
• Small, isolated areas of sandy outwash

Similar soils:
• Soils that have more clay or less sand in the subsoil
• Soils that have a darker surface layer or a surface layer of loam

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• The hazard of further water erosion is severe if the soil is used for cultivated crops.
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, minimize crusting, and increase the rate of water infiltration.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Dwellings

Management concerns: The shrink-swell potential and the slope
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: The moderate permeability and the slope
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 5A

8F—Hickory silt loam, 18 to 30 percent slopes

Composition

Hickory and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Woodland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 4 inches—very dark grayish brown silt loam
Subsurface layer:
4 to 12 inches—brown silt loam
Subsoil:
12 to 55 inches—yellowish brown clay loam
Substratum:
55 to 60 inches—yellowish brown clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils on the upper side slopes
• The moderately well drained Marseilles soils on the lower side slopes or in landscape positions similar to those of the Hickory soil
• Small, isolated areas of sandy outwash
Similar soils:
• Soils that have a darker surface layer or a surface layer of loam
• Soils that have more clay or less sand in the subsoil

Use and Management

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Slope
Management measures:
• Using a no-till method of seeding or pasture renovation helps to establish forage species and control erosion.
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Woodland

Management concerns: Plant competition and erosion
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Wildlife habitat

Management concerns: None
Management measures:
• This soil is suitable for grain and seed crops, wild herbaceous plants, and hardwood trees.
• The habitat should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Slope

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 5R

8G—Hickory silt loam, 30 to 50 percent slopes

Composition

Hickory and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Woodland and pasture

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 4 inches—dark grayish brown silt loam
Subsurface layer:
4 to 9 inches—dark grayish brown and brown silt loam

Subsoil:
9 to 20 inches—yellowish brown clay loam
20 to 40 inches—yellowish brown, mottled clay loam
40 to 55 inches—light olive brown, mottled clay loam

Substratum:
55 to 60 inches—yellowish brown, mottled clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils on the upper side slopes
• The moderately well drained Marseilles soils on the lower side slopes
• Small, isolated areas of sandy outwash

Similar soils:
• Soils that have more clay or less sand in the subsoil
• Soils that have slopes of more than 50 percent or less than 30 percent

Use and Management

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Slope
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Seeding, fertilizing, and spraying by airplane or by hand help to control erosion.

Woodland

Management concerns: Slope, erosion, equipment limitations, and plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Wildlife habitat

Management measures:
• This soil is suitable for grain and seed crops, wild herbaceous plants, and hardwood trees.
• The habitat should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Slope

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 5R

17A—Keomah silt loam, 0 to 2 percent slopes

Composition

Keomah and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Broad ridgetops
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Parent material: Loess
Runoff: Slow
Available water capacity: High
Seasonal high water table: At a depth of 2 to 4 feet
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown silt loam

Subsurface layer:
7 to 11 inches—brown silt loam

Subsoil:
11 to 20 inches—brown silty clay loam
20 to 28 inches—yellowish brown, mottled silty clay
28 to 55 inches—grayish brown and olive, mottled silty clay loam

Substratum:
55 to 60 inches—olive gray, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Denny soils and other wet spots in shallow depressions

Similar soils:
• Soils that have a darker surface layer
• Soils that have a seasonal high water table at a depth of more than 4 feet
• Soils that have slopes of more than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness
Management measures:
• Maintaining a subsoil tile drainage system helps to lower the water table.

Pasture and hay

Suitable species: Bromegrass, tall fescue, alsike clover, and alfalfa
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: Wetness and the shrink-swell potential
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: The restricted permeability and wetness
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIw

19D2—Sylvan silt loam, 10 to 18 percent slopes, eroded

Composition

Sylvan and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 5 inches—brown silt loam
Subsoil:
5 to 19 inches—yellowish brown silty clay loam
19 to 30 inches—yellowish brown silt loam
Substratum:
30 to 60 inches—light brownish gray silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
• Small, isolated areas of sandy outwash
Similar soils:
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have free lime within a depth of 20 inches
• Soils in which the subsoil formed in glacial till

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or

the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential and the slope
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: Slope
Management measures:
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IIIe

19D3—Sylvan silty clay loam, 10 to 18 percent slopes, severely eroded

Composition

Sylvan and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Very low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—brown silty clay loam
Subsoil:
8 to 22 inches—brown silty clay loam
22 to 28 inches—brown silt loam
Substratum:
28 to 60 inches—pale brown silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
• Small, isolated areas of sandy outwash
Similar soils:
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have free lime within a depth of 20 inches
• Soils in which the subsoil formed in glacial till

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• The hazard of further water erosion is severe if this soil is used for cultivated crops.
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, minimize crusting, and increase the rate of water infiltration.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.

• New stands should be protected from fire and from grazing by livestock.

Dwellings

Management concerns: The shrink-swell potential and the slope
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: Slope
Management measures:
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 6A

36B—Tama silt loam, 2 to 5 percent slopes

Composition

Tama and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Medium
Available water capacity: Very high
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 9 inches—very dark grayish brown silt loam
Subsurface layer:
9 to 16 inches—dark brown silt loam
Subsoil:
16 to 22 inches—brown silty clay loam
22 to 32 inches—yellowish brown silty clay loam
32 to 60 inches—yellowish brown, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The poorly drained Sable soils, which are in depressions or on broad upland flats and are subject to ponding
• The poorly drained Denny soils, which are in depressions and are subject to ponding

Similar soils:
• Soils that have a seasonal high water table within a depth of 4 feet
• Soils that have slopes of less than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Applying a conservation tillage system that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, terraces, or a combination of these practices helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Management concerns: The shrink-swell potential and wetness
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIe

36B2—Tama silt loam, 2 to 5 percent slopes, eroded

Composition

Tama and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Medium
Available water capacity: High
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—very dark brown silt loam; mixed with brown in the lower part

Subsoil:
8 to 17 inches—brown and very dark brown silty clay loam
17 to 26 inches—yellowish brown silty clay loam
26 to 43 inches—yellowish brown, mottled silty clay loam

Substratum:
43 to 60 inches—brown, grayish brown, and yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Denny soils, which are in depressions and are subject to ponding
• The poorly drained Sable soils, which are in depressions or on broad upland flats and are subject to ponding

Similar soils:
• Soils that have a surface layer of silty clay loam
• Soils that have a thinner and lighter colored surface layer

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Applying a conservation tillage system that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, terraces, or a combination of these practices helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Management concerns: The shrink-swell potential and wetness
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIe

36C2—Tama silt loam, 5 to 10 percent slopes, eroded

Composition

Tama and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—very dark grayish brown silt loam; mixed with dark yellowish brown in the lower part

Subsoil:
6 to 20 inches—dark yellowish brown silty clay loam
20 to 39 inches—yellowish brown, mottled silty clay loam
39 to 43 inches—yellowish brown, mottled silt loam

Substratum:
43 to 60 inches—light yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Radford soils on flood plains

Similar soils:
• Soils that have a buried soil within a depth of 40 inches
• Soils that have a thinner subsoil and have free lime within a depth of 40 inches
• Soils that have a seasonal high water table at a depth of more than 6 feet

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Applying a conservation tillage system that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, terraces, or a combination of these practices helps to control erosion.
• A rotation that includes 1 or more years of forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential and wetness
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIIe

36C3—Tama silty clay loam, 5 to 10 percent slopes, severely eroded

Composition

Tama and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe

Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—dark yellowish brown silty clay loam
Subsoil:
8 to 14 inches—dark yellowish brown, mottled silty clay loam
14 to 36 inches—yellowish brown, mottled silty clay loam and silt loam
Substratum:
36 to 60 inches—grayish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Radford soils on flood plains
Similar soils:
• Soils that have a surface layer of silt loam
• Soils that have a thinner subsoil and have free lime within a depth of 40 inches
• Soils that have a buried soil within a depth of 40 inches
• Soils that have a seasonal high water table at a depth of more than 6 feet

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• The hazard of further water erosion is severe if the soil is used for cultivated crops.
• Applying a conservation tillage system that leaves crop residue on the surface after planting, returning crop residue to the soil, and adding green manure or animal manure help to control erosion, maintain productivity, improve tilth, minimize crusting, and increase the rate of water infiltration.
• A rotation that includes 1 or more years of forage crops helps to control erosion.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: The shrink-swell potential and wetness
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: Wetness
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IVe

36D2—Tama silt loam, 10 to 15 percent slopes, eroded

Composition

Tama and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—black silt loam
Subsoil:
8 to 13 inches—mixed brown and very dark grayish brown silty clay loam
13 to 37 inches—brown, dark yellowish brown, and yellowish brown silty clay loam

37 to 51 inches—yellowish brown, mottled silty clay loam

Substratum:
51 to 60 inches—yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Radford soils on flood plains

Similar soils:
• Soils that have a thinner or lighter colored surface layer
• Soils that have a thinner subsoil and have free lime within a depth of 40 inches
• Soils that have a buried soil within a depth of 40 inches

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential and the slope
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: Slope
Management measures:
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IIIe

41A—Muscatine silt loam, 0 to 2 percent slopes

Composition

Muscatine and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Wide ridges and flats
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Loess
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At a depth of 2 to 4 feet
Organic matter content: High
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 11 inches—very dark brown silt loam

Subsurface layer:
11 to 18 inches—very dark brown silt loam

Subsoil:
18 to 22 inches—mixed very dark grayish brown and grayish brown silty clay loam
22 to 48 inches—grayish brown, mottled silty clay loam
48 to 56 inches—light brownish gray, mottled silt loam

Substratum:
56 to 60 inches—light brownish gray, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Denny soils, which are in depressions and are subject to ponding
• The poorly drained Sable soils, which are on broad flats or in depressions and are subject to ponding

Similar soils:
• Soils in which the subsoil is calcareous above a depth of 48 inches
• Soils that have a seasonal high water table at a depth of more than 4 feet

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness
Management measures:
• Maintaining a subsoil tile drainage system helps to lower the water table.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, tall fescue, alsike clover, and alfalfa
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: Wetness and the shrink-swell potential
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: I

43A—Ipava silt loam, 0 to 2 percent slopes

Composition

Ipava and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform position: Wide ridges and flats
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Parent material: Loess
Runoff: Slow
Available water capacity: High
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: High
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 11 inches—very dark brown silt loam
Subsurface layer:
11 to 18 inches—very dark brown silty clay loam
Subsoil:
18 to 24 inches—mixed brown and dark grayish brown silty clay loam
24 to 60 inches—brown and light brownish gray, mottled silty clay loam and silty clay

Inclusions

Contrasting inclusions:
• The poorly drained Sable soils, which are on broad flats and in depressions and are subject to ponding
• The poorly drained Denny soils, which are in depressions and are subject to ponding
Similar soils:
• Soils that have a thinner surface layer
• Soils that have a lighter colored subsurface layer
• Soils that have a seasonal high water table at a depth of more than 3 feet

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth.
• Maintaining a subsoil tile drainage system helps to lower the water table.

Pasture and hay

Suitable species: Bromegrass, tall fescue, alsike clover, and alfalfa
Management concerns: Wetness

Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: Wetness and the shrink-swell potential
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness and the moderately slow permeability
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: I

43B—Ipava silt loam, 2 to 4 percent slopes

Composition

Ipava and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Parent material: Loess
Runoff: Moderate
Available water capacity: High
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: High
Erosion hazard: Moderate
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 10 inches—very dark gray silt loam

Subsurface layer:
10 to 17 inches—mixed very dark gray and brown silt loam

Subsoil:
17 to 24 inches—mixed brown and very dark gray silty clay loam
24 to 34 inches—grayish brown, mottled silty clay loam
34 to 58 inches—light brownish gray silty clay loam

Substratum:
58 to 60 inches—light brownish gray silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Sable soils, which are on broad flats and in depressions and are subject to ponding
• The poorly drained Denny soils, which are in depressions and are subject to ponding

Similar soils:
• Soils that have a thinner surface layer
• Soils that have a lighter colored subsurface layer
• Soils that have a seasonal high water table at a depth of more than 3 feet

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion and wetness
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, terraces, or a combination of these practices helps to control erosion.
• Maintaining a subsoil tile drainage system helps to lower the water table.

Pasture and hay

Suitable species: Bromegrass, tall fescue, alsike clover, and alfalfa
Management concerns: Erosion and wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: Wetness and the shrink-swell potential
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness and the moderately slow permeability
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIe

45—Denny silt loam

Composition

Denny and similar soils: 92 to 97 percent
Contrasting inclusions: 3 to 8 percent

Setting

Landform position: Depressions
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Slow
Parent material: Loess
Runoff: Slow to ponded
Available water capacity: High
Seasonal high water table: 1 foot above to 2 feet below the surface
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—very dark gray silt loam

Subsurface layer:
8 to 17 inches—dark grayish brown, mottled silt loam

Subsoil:
17 to 33 inches—gray, mottled silty clay loam and silty clay
33 to 60 inches—olive gray and light olive gray, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Muscatine and Ipava soils and the moderately well drained Tama soils on the slightly higher ridges

Similar soils:
• Soils that have a thicker or lighter colored surface layer

Use and Management

Cropland

Suitability: Moderately well suited
Management concerns: Wetness
Management measures:
• Maintaining a subsoil tile drainage system helps to lower the water table.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Wetness
Management measures:
• Maintaining a tile drainage system helps to lower the water table.
• Deferring grazing when the soil is too wet minimizes surface compaction and helps to maintain tilth.
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Suitability: Unsuited
Management concerns: Ponding and the shrink-swell potential

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Ponding

Interpretive Groups

Land capability classification: IIIw

61A—Atterberry silt loam, 0 to 2 percent slopes

Composition

Atterberry and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Wide ridges and flats
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Loess
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown silt loam

Subsurface layer:
8 to 13 inches—grayish brown silt loam

Subsoil:
13 to 16 inches—brown silt loam
16 to 50 inches—brown, grayish brown, and light olive gray, mottled silty clay loam

Substratum:
50 to 60 inches—light olive gray, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Denny and Sable soils, which are in depressions and are subject to ponding

Similar soils:
• Soils that have a thicker surface layer
• Soils that have a lighter colored surface layer
• Soils that have a seasonal high water table at a depth of more than 3 feet

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.
• Maintaining a subsoil tile drainage system helps to lower the water table.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, alsike clover, and alfalfa
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: Wetness
Management measures:
• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: I

67—Harpster silty clay loam

Composition

Harpster and similar soils: 92 to 98 percent
Contrasting inclusions: 2 to 8 percent

Setting

Landform position: Broad flats and depressions
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderate
Parent material: Loess
Runoff: Slow to ponded
Available water capacity: High
Seasonal high water table: 0.5 foot above to 2.0 feet below the surface
Organic matter content: High
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—black silty clay loam

Subsurface layer:
8 to 21 inches—black silty clay loam

Subsoil:
21 to 35 inches—gray, mottled silty clay loam
35 to 44 inches—light olive gray and olive gray, mottled silt loam

Substratum:
44 to 60 inches—light olive gray, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Sable soils, which are in positions on the landscape similar to those of the Harpster soil
• Soils that do not have carbonates within a depth of 20 inches

Similar soils:
• Soils that have a thicker surface layer

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Wetness and tilth
Management measures:
• Maintaining a subsoil tile drainage system helps to lower the water table.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, and adding green manure or animal manure maintain productivity, improve tilth, and minimize compaction.
• Adding soil amendments helps to lower the pH.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Wetness and tilth
Management measures:
• Maintaining a tile drainage system helps to lower the water table.
• Deferring grazing when the soil is too wet minimizes surface compaction and helps to maintain tilth.
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Suitability: Unsuited
Management concerns: Ponding

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Ponding

Interpretive Groups

Land capability classification: IIw

68—Sable silty clay loam

Composition

Sable and similar soils: 92 to 98 percent
Contrasting inclusions: 2 to 8 percent

Setting

Landform position: Broad flats and depressions
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderate
Parent material: Loess
Runoff: Slow to ponded
Available water capacity: Very high
Seasonal high water table: 0.5 foot above to 2.0 feet below the surface
Organic matter content: High
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—black silty clay loam

Subsurface layer:
8 to 23 inches—black and very dark gray silty clay loam

Subsoil:
23 to 29 inches—dark gray, mottled silty clay loam
29 to 47 inches—grayish brown and gray, mottled silty clay loam

Substratum:
47 to 60 inches—gray, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Muscatine and Ipava soils and the moderately well drained Tama soils on the slightly higher ridges
• Denny soils, which are in depressions and have a lighter colored subsurface layer than that of the Sable soil

Similar soils:
• Soils that have a thicker surface layer
• Soils that have carbonates within a depth of 35 inches

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness and tilth
Management measures:
• Maintaining a subsoil tile drainage system helps to lower the water table.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, and adding green manure or animal manure maintain productivity, improve tilth, and minimize compaction.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management measures:
Management concerns: Wetness and tilth
• Maintaining a tile drainage system helps to lower the water table.
• Deferring grazing when the soil is too wet minimizes surface compaction and helps to maintain tilth.
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Suitability: Unsuited
Management concerns: Ponding

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Ponding

Interpretive Groups

Land capability classification: IIw

68+—Sable silt loam, overwash

Composition

Sable and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Depressions
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderate
Parent material: Loess
Runoff: Slow to ponded
Available water capacity: Very high
Seasonal high water table: 0.5 foot above to 2.0 feet below the surface
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 14 inches—very dark gray silt loam

Subsurface layer:
14 to 31 inches—black and very dark gray, mottled silty clay loam

Subsoil:
31 to 41 inches—dark gray, mottled silty clay loam
41 to 56 inches—light olive gray and gray, mottled silty clay loam and silt loam

Substratum:
56 to 60 inches—gray, mottled silt loam

Inclusions

Contrasting inclusions:
• Denny soils, which are in landscape positions similar to those of the Sable soil and have a lighter colored subsurface layer
• The somewhat poorly drained Ipava soils in the higher landscape positions

Similar soils:
• Soils that have a thicker surface layer
• Soils that contain more clay

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness and tilth
Management measures:
• Maintaining a subsoil tile drainage system helps to lower the water table.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Wetness and tilth
Management measures:
• Maintaining a tile drainage system helps to lower the water table.
• Deferring grazing when the soil is too wet minimizes surface compaction and helps to maintain tilth.
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Suitability: Unsuited
Management concerns: Ponding

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Ponding

Interpretive Groups

Land capability classification: IIw

81A—Littleton silt loam, 0 to 2 percent slopes

Composition

Littleton and similar soils: 100 percent

Setting

Landform position: Foot slopes
Landscape: Terraces
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Silty alluvium
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—very dark gray silt loam

Subsurface layer:
7 to 30 inches—black and very dark grayish brown silt loam

Subsoil:
30 to 55 inches—brown and grayish brown, mottled silt loam

Substratum:
55 to 60 inches—light brownish gray, mottled silt loam

Inclusions

Similar soils:
- Soils that have a thinner subsurface layer
- Soils that have a seasonal high water table at a depth of less than 1 foot or more than 3 feet
- Soils that have slopes of more than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness
Management measures:
- Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth.
- Maintaining a subsoil tile drainage system helps to lower the water table.

Pasture and hay

Suitable species: Bromegrass, tall fescue, alsike clover, and alfalfa
Management concerns: Wetness
Management measures:
- Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
- Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: Wetness
Management measures:
- Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
- Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: I

119D2—Elco silt loam, 10 to 15 percent slopes, eroded

Composition

Elco and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Parent material: Loess and glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: Perched at a depth of 2.5 to 4.5 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—mixed dark grayish brown and brown silt loam

Subsurface layer:
7 to 11 inches—brown silt loam
Subsoil:
11 to 23 inches—dark yellowish brown silty clay loam
23 to 34 inches—yellowish brown silty clay loam
34 to 60 inches—olive brown, mottled clay

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils, which have a clayey subsoil within a depth of 20 inches and are very slowly permeable
• Small, isolated areas of sandy outwash
Similar soils:
• Soils that have less clay in the subsoil
• Soils that have more than 40 inches of loess over till

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: Slope, the shrink-swell potential, and wetness
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness and the restricted permeability
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing filter lines on the contour helps to distribute the effluent evenly.
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIIe

119E2—Elco silt loam, 15 to 20 percent slopes, eroded

Composition

Elco and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Parent material: Loess and glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: Perched at a depth of 2.5 to 4.5 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 2 inches—dark grayish brown silt loam
Subsurface layer:
2 to 9 inches—mixed brown and dark grayish brown silt loam
Subsoil:
9 to 26 inches—yellowish brown silty clay loam

26 to 32 inches—light yellowish brown, mottled silty clay loam
32 to 60 inches—brown and grayish brown, mottled clay

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Atlas soils, which have a clayey subsoil within a depth of 20 inches and are very slowly permeable
- Small, isolated areas of sandy outwash

Similar soils:
- Soils that have less clay in the subsoil
- Soils that are more than 40 inches deep to till
- Soils that have slopes of more than 20 percent

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
- Contour farming and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
- A rotation dominated by forage crops helps to control erosion.
- Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
- Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
- Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
- Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.
- Using a no-till method of seeding or pasture renovation helps to establish forage species and control erosion.

Woodland

Management concerns: Plant competition
Management measures:
- Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
- In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
- New stands should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Wetness, the restricted permeability, and the slope

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4R

250D2—Velma silt loam, 10 to 18 percent slopes, eroded

Composition

Velma and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 7 inches—mixed very dark gray and brown silt loam

Subsoil:
7 to 32 inches—dark yellowish brown and yellowish brown clay loam
32 to 45 inches—brown, mottled clay loam

Substratum:
45 to 60 inches—yellowish brown, mottled clay loam

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Atlas soils, which have

a clayey subsoil within a depth of 20 inches and are very slowly permeable

Similar soils:
• Soils that have more clay in the subsoil
• Soils that have a lighter colored surface layer

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: Slope and the shrink-swell potential
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: The moderate permeability and the slope
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IIIe

257A—Clarksdale silt loam, 0 to 2 percent slopes

Composition

Clarksdale and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Wide ridges and flats
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Parent material: Loess
Runoff: Slow
Available water capacity: High
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown silt loam

Subsurface layer:
8 to 16 inches—dark gray and dark grayish brown silt loam

Subsoil:
16 to 24 inches—dark grayish brown, mottled silty clay loam
24 to 60 inches—light brownish gray, mottled silty clay loam and silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Denny soils, which are in depressions and are subject to ponding

Similar soils:
• Soils that have a thicker or lighter colored surface layer
• Soils that have less clay in the subsoil

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness

Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.
• Maintaining a subsoil tile drainage system helps to lower the water table.

Pasture and hay

Suitable species: Bromegrass, tall fescue, alsike clover, and alfalfa
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: The shrink-swell potential and wetness
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: The moderately slow permeability and the wetness
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: I

259C2—Assumption silt loam, 5 to 10 percent slopes, eroded

Composition

Assumption and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes along drainageways
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Parent material: Loess and glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: Perched at a depth of 2.5 to 4.5 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—mixed very dark grayish brown and brown silt loam

Subsoil:
8 to 26 inches—brown and dark yellowish brown silty clay loam
26 to 32 inches—yellowish brown, mottled silty clay loam
32 to 60 inches—dark grayish brown, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Radford soils on flood plains

Similar soils:
• Soils that have a thinner and lighter colored surface layer
• Soils that formed entirely in loess or loamy till
• Soils in which the loess is less than 20 inches thick

Use and Management

Cropland

Suitability: Moderately well suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, terraces, and a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation that includes 1 or more years of forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure helps to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion

Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: The restricted permeability and the wetness
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIIe

259D2—Assumption silt loam, 10 to 15 percent slopes, eroded

Composition

Assumption and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Parent material: Loess over glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: Perched at a depth of 2.5 to 4.5 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—mixed dark brown and yellowish brown silt loam

Subsoil:
8 to 15 inches—yellowish brown silty clay loam
15 to 27 inches—yellowish brown, mottled silty clay loam
27 to 60 inches—grayish brown and dark grayish brown, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Radford soils on flood plains

Similar soils:
• Soils that have a thinner and lighter colored surface layer
• Soils that have less than 20 inches of loess
• Soils that formed entirely in loess or in loamy till

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential and the slope

Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: The restricted permeability, the slope, and wetness
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing filter lines on the contour helps to distribute the effluent evenly.
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIIe

268B—Mt. Carroll silt loam, 2 to 5 percent slopes

Composition

Mt. Carroll and similar soils: 100 percent

Setting

Landform position: Narrow ridges
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Medium
Available water capacity: Very high
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—mixed very dark grayish brown and brown silt loam

Subsurface layer:
8 to 16 inches—brown silt loam

Subsoil:
16 to 36 inches—dark yellowish brown silt loam
36 to 56 inches—yellowish brown and light brownish gray, mottled silt loam

Substratum:
56 to 60 inches—mixed light brownish gray and yellowish brown, mottled silt loam

Inclusions

Similar soils:
• Soils that have a thicker or lighter colored surface layer
• Soils that have a seasonal high water table within a depth of 4 feet
• Soils that have slopes of less than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, and terraces also help to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Suitability: Well suited
Management concerns: Wetness
Management measures:
• Installing tile drains near the foundations lowers the water table on sites for dwellings with basements.
• Onsite investigation is needed.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.
• Onsite investigation is needed.

Interpretive Groups

Land capability classification: IIe

274C2—Seaton silt loam, 5 to 10 percent slopes, eroded

Composition

Seaton and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes and ridgetops
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: Very high
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 9 inches—mixed brown and yellowish brown silt loam
Subsoil:
9 to 34 inches—yellowish brown silt loam
34 to 56 inches—yellowish brown, mottled silt loam
Substratum:
56 to 60 inches—yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
Similar soils:
• Soils that have a darker surface layer
• Soils that have carbonates within a depth of 40 inches

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Erosion
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, and terraces help to control erosion.
• A rotation that includes 1 or more years of forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Well suited
Management concerns: None
Management measures:
• Onsite investigation is needed.

Septic tank absorption fields

Management concerns: Ponding
Management measures:
• Onsite investigation is needed.

Interpretive Groups

Land capability classification: IIIe

274D—Seaton silt loam, 10 to 15 percent slopes

Composition

Seaton and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: Very high
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—mixed dark grayish brown and yellowish brown silt loam
Subsurface layer:
8 to 11 inches—mixed brown and yellowish brown silt loam
Subsoil:
11 to 55 inches—yellowish brown silt loam
55 to 60 inches—mixed yellowish brown and light yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
Similar soils:
• Soils that have carbonates within a depth of 40 inches
• Soils that have a darker surface layer
• Soils that are moderately or severely eroded

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: Slope
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.

Septic tank absorption fields

Management concerns: Slope
Management measures:
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IIIe

275A—Joy silt loam, 0 to 2 percent slopes

Composition

Joy and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Wide ridges and flats
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Loess
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At a depth of 2 to 4 feet
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 13 inches—black silt loam
Subsurface layer:
13 to 19 inches—black silt loam
Subsoil:
19 to 54 inches—brown and grayish brown, mottled silt loam
Substratum:
54 to 60 inches—light brownish gray, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Denny soils, which are in depressions and are subject to ponding
Similar soils:
• Soils that have a thicker surface layer and subsurface layer
• Soils that have a seasonal high water table at a depth of less than 2 feet or more than 4 feet

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth.
• Maintaining a subsoil tile drainage system helps to lower the water table.

Pasture and hay

Suitable species: Bromegrass, tall fescue, alsike clover, and alfalfa
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: Wetness
Management measures:
• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: I

277B—Port Byron silt loam, 2 to 5 percent slopes

Composition

Port Byron and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Medium
Available water capacity: Very high
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: High
Erosion hazard: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 11 inches—very dark brown silt loam

Subsurface layer:
11 to 16 inches—mixed dark brown and very dark brown silt loam

Subsoil:
16 to 50 inches—brown, dark yellowish brown, and yellowish brown silt loam
50 to 60 inches—yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Denny soils, which are in depressions and are subject to ponding

Similar soils:
• Soils that have a seasonal high water table within a depth of 4 feet
• Soils in which the thickness of the solum and the depth to carbonates are less than 42 inches
• Soils that have slopes of 0 to 2 percent

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, and terraces help to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Management concerns: Wetness
Management measures:
• Installing tile drains near the foundations helps to

lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIe

277C2—Port Byron silt loam, 5 to 10 percent slopes, eroded

Composition

Port Byron and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Side slopes and ridgetops
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: Very high
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 9 inches—very dark brown silt loam

Subsoil:
9 to 27 inches—brown and yellowish brown silt loam
27 to 60 inches—yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Radford soils on flood plains

Similar soils:
• Soils that have a thinner surface layer
• Soils that have a seasonal high water table within a depth of 4 feet
• Soils in which the thickness of the solum and the depth to carbonates are less than 42 inches

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, and terraces help to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: Wetness
Management measures:
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIIe

278A—Stronghurst silt loam, 0 to 2 percent slopes

Composition

Stronghurst and similar soils: 100 percent

Setting

Landform position: Wide ridges and flats
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Loess
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown silt loam

Subsurface layer:
7 to 13 inches—brown, mottled silt loam

Subsoil:
13 to 17 inches—mixed brown and grayish brown, mottled silt loam
17 to 48 inches—brown, grayish brown, and light grayish brown, mottled silty clay loam

Substratum:
48 to 60 inches—light olive gray, mottled silt loam

Inclusions

Similar soils:
• Soils that have a darker surface layer
• Soils that have a seasonal high water table at a depth of less than 1 foot or more than 3 feet

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Maintaining a subsoil tile drainage system helps to lower the water table.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, alsike clover, and alfalfa
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining a tile drainage system helps to lower the water table.

Dwellings

Management concerns: Wetness
Management measures:
• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIw

279B—Rozetta silt loam, 2 to 5 percent slopes

Composition

Rozetta and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Medium
Available water capacity: Very high
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderately low
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 9 inches—dark grayish brown silt loam

Subsurface layer:
9 to 13 inches—brown silt loam

Subsoil:
13 to 26 inches—yellowish brown silty clay loam
26 to 60 inches—yellowish brown, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atterberry and Clarksdale soils in nearly level areas

Similar soils:
• Soils that have a darker surface layer
• Soils that have a seasonal high water table at a depth of less than 4 or more than 6 feet
• Soils that have slopes of less than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces help to control erosion.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Management concerns: Wetness and the shrink-swell potential
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIe

279C2—Rozetta silt loam, 5 to 10 percent slopes, eroded

Composition

Rozetta and similar soils: 100 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: Very high
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—mixed brown and dark yellowish brown silt loam

Subsoil:
7 to 12 inches—dark yellowish brown silty clay loam
12 to 50 inches—yellowish brown, mottled silty clay loam

Substratum:
50 to 60 inches—dark yellowish brown, mottled silt loam

Inclusions

Similar soils:
• Soils that have a darker surface layer
• Soils that have a seasonal high water table at a depth of more than 6 feet

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces help to control erosion.
• A rotation that includes 1 or more years of forage crops helps to control erosion.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.

• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential and wetness
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIIe

279C3—Rozetta silty clay loam, 5 to 10 percent slopes, severely eroded

Composition

Rozetta and similar soils: 100 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: Very high
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Very low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—mixed dark brown and yellowish brown silty clay loam
Subsoil:
7 to 19 inches—yellowish brown silty clay loam
19 to 42 inches—yellowish brown, mottled silty clay loam and silt loam
Substratum:
42 to 60 inches—yellowish brown, mottled silt loam

Inclusions

Similar soils:
• Soils that have a darker surface layer
• Soils that have a seasonal high water table at a depth of more than 6 feet

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• The hazard of further water erosion is severe if the soil is used for cultivated crops.
• A rotation that includes 1 or more years of forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, minimize crusting, and increase the rate of water infiltration.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Dwellings

Management concerns: The shrink-swell potential and wetness
Management measures:
• Extending the footings below the subsoil or reinforcing

the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4A

280B—Fayette silt loam, 2 to 5 percent slopes

Composition

Fayette and similar soils: 90 to 98 percent
Contrasting inclusions: 2 to 10 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Medium
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 4 inches—very dark grayish brown silt loam
Subsurface layer:
4 to 11 inches—brown silt loam
Subsoil:
11 to 55 inches—yellowish brown silt loam and silty clay loam
55 to 60 inches—yellowish brown, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Keomah and Clarksdale soils in nearly level areas
Similar soils:
• Soils that have a darker surface layer
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have slopes of less than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces help to control erosion.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Management concerns: The shrink-swell potential
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Well suited
Management concerns: None
Management measures:
• Onsite investigation is needed.

Interpretive Groups

Land capability classification: IIe

280C2—Fayette silt loam, 5 to 10 percent slopes, eroded

Composition

Fayette and similar soils: 100 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—brown silt loam

Subsoil:
7 to 50 inches—dark yellowish brown and yellowish brown silty clay loam

Substratum:
50 to 60 inches—dark yellowish brown, mottled silt loam

Inclusions

Similar soils:
• Soils that have a darker surface layer
• Soils that have a seasonal high water table within a depth of 6 feet

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces help to control erosion.
• A rotation that includes 1 or more years of forage crops helps to control erosion.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Well suited
Management concerns: None
Management measures:
• Onsite investigation is needed.

Interpretive Groups

Land capability classification: IIIe

280D2—Fayette silt loam, 10 to 15 percent slopes, eroded

Composition

Fayette and similar soils: 92 to 97 percent
Contrasting inclusions: 3 to 8 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: pasture

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 5 inches—mixed dark grayish brown and yellowish brown silt loam

Subsurface layer:
5 to 9 inches—mixed brown and yellowish brown silt loam

Subsoil:
9 to 13 inches—dark yellowish brown silt loam

13 to 55 inches—yellowish brown silty clay loam and silt loam

Substratum:
55 to 60 inches—yellowish brown silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
• Small, isolated areas of sandy outwash

Similar soils:
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have free lime within a depth of 40 inches
• Soils in which the subsoil formed in glacial till

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: Slope and the shrink-swell potential
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: Slope
Management measures:
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IIIe

280D3—Fayette silty clay loam, 10 to 15 percent slopes, severely eroded

Composition

Fayette and similar soils: 92 to 97 percent
Contrasting inclusions: 3 to 8 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—dark brown silty clay loam

Subsoil:
8 to 36 inches—dark yellowish brown silty clay loam
36 to 54 inches—dark yellowish brown, mottled silt loam

Substratum:
54 to 60 inches—dark yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
• Small, isolated areas of sandy outwash

Similar soils:
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have free lime within a depth of 40 inches
• Soils in which the subsoil formed in glacial till

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• The hazard of further water erosion is severe if the soil is used for cultivated crops.
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, minimize crusting, and increase the rate of water infiltration.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• The woodland should be protected from fire and from grazing by livestock.

Dwellings

Management concerns: Slope and the shrink-swell potential
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: Slope
Management measures:
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4A

280E2—Fayette silt loam, 15 to 20 percent slopes, eroded

Composition

Fayette and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 4 inches—dark grayish brown silt loam

Subsurface layer:
4 to 12 inches—brown and mixed brown and yellowish brown silt loam

Subsoil:
12 to 60 inches—yellowish brown silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
• Small, isolated areas of sandy outwash

Similar soils:
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have free lime within a depth of 40 inches
• Soils in which the subsoil formed in glacial till

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.
• Using a no-till method of seeding or pasture renovation helps to establish forage species and control erosion.

Woodland

Management concerns: Erosion, slope, plant competition, and equipment limitations
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Slope

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4R

386B—Downs silt loam, 2 to 5 percent slopes

Composition

Downs and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Medium
Available water capacity: High
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—very dark grayish brown silt loam
Subsoil:
7 to 13 inches—brown silt loam
13 to 21 inches—brown silty clay loam
21 to 48 inches—dark yellowish brown, mottled silty clay loam
48 to 60 inches—yellowish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Denny soils, which have more clay in the subsoil than the Downs soil and are in depressions

Similar soils:
• Soils that have a thicker or lighter colored surface layer
• Soils that have a seasonal high water table at a depth of less than 4 feet
• Soils that have more clay in the subsoil
• Soils that have slopes of less than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces help to control erosion.
• Applying a system of conservation tillage that leaves

crop residue on the surface after planting helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Management concerns: The shrink-swell potential and wetness
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIe

386C2—Downs silt loam, 5 to 10 percent slopes, eroded

Composition

Downs and similar soils: 100 percent

Setting

Landform position: Ridgetops and side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—mixed very dark grayish brown and brown silt loam
Subsoil:
6 to 23 inches—dark yellowish brown silty clay loam
23 to 32 inches—yellowish brown, mottled silty clay loam
32 to 51 inches—yellowish brown, mottled silt loam
Substratum:
51 to 60 inches—yellowish brown, mottled silt loam

Inclusions

Similar soils:
• Soils that have a thinner or lighter colored surface layer
• Soils that have a thicker surface layer
• Soils that have underlying calcareous material within a depth of 20 to 40 inches

Use and Management

Cropland

Suitability: Moderate
Management concerns: Erosion
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, and terraces help to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management concerns: The shrink-swell potential and wetness
Management measures:
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

• Installing tile drains near the foundations helps to lower the water table on sites for dwellings with basements.

Septic tank absorption fields

Management concerns: Wetness
Management measures:
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: IIIe

430B—Raddle silt loam, 2 to 5 percent slopes

Composition

Raddle and similar soils: 100 percent

Setting

Landform position: Foot slopes
Landscape: Terraces
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Silty alluvium
Runoff: Medium
Available water capacity: Very high
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown silt loam

Subsurface layer:
8 to 17 inches—very dark gray and dark grayish brown silt loam

Subsoil:
17 to 34 inches—brown and yellowish brown silt loam
34 to 50 inches—yellowish brown, mottled silt loam

Substratum:
50 to 60 inches—yellowish brown, mottled silt loam

Inclusions

Similar soils:
• Soils that have a thinner surface layer
• Soils that have slopes of more than 5 percent or less than 2 percent
• Soils that have a seasonal high water table within a depth of 4 feet

Use and Management

Cropland

Suitability: Well suited
Management concerns: Erosion
Management measures:
• Applying a system of conservation tillage that leaves crop residue on the surface after planting helps to control erosion.
• Contour farming, stripcropping, and terraces help to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Management concerns: None
Management measures:
• Onsite investigation is needed.

Septic tank absorption fields

Management concerns: None
Management measures:
• Onsite investigation is needed.

Interpretive Groups

Land capability classification: IIe

505G—Dunbarton silt loam, 20 to 60 percent slopes

Composition

Dunbarton and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Woodland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Slow
Parent material: Loess and clayey residuum
Runoff: Rapid
Available water capacity: Very low

Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 2 inches—very dark grayish brown silt loam
Subsurface layer:
2 to 4 inches—brown silt loam
Subsoil:
4 to 10 inches—yellowish brown silt loam
10 to 16 inches—reddish brown silty clay
Bedrock:
16 to 60 inches—limestone

Inclusions

Contrasting inclusions:
• Westville soils, which formed in loamy red till and are in landscape positions similar to those of the Dunbarton soil
Similar soils:
• Soils that are more than 20 inches deep to limestone
• Soils that are underlain by shale

Use and Management

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Seeding, fertilizing, and spraying by airplane or by hand help to control erosion.

Woodland

Management concerns: Erosion, plant competition, and equipment limitations
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.
• Machinery should be used only when the soil is firm enough to support the equipment.

Wildlife habitat

Management concerns: Slope
Management measures:
• This soil is suited to grain and seed crops, wild herbaceous plants, and hardwood trees.
• The habitat should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Slope

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 4R

549D2—Marseilles silt loam, 10 to 18 percent slopes, eroded

Composition

Marseilles and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Parent material: Loess and shale
Runoff: Rapid
Available water capacity: Low
Seasonal high water table: Perched at a depth of 1.5 to 3.5 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown silt loam
Subsurface layer:
5 to 12 inches—mixed very dark grayish brown and yellowish brown silt loam
Subsoil:
12 to 32 inches—yellowish brown silt loam and silty clay loam
Bedrock:
32 to 60 inches—soft shale

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils, which formed in glacial till and are on the upper side slopes
• Elco soils, which formed in loess and glacial till and are on the upper side slopes
• The well drained Hickory soils, which formed in glacial till and are on the upper side slopes or in landscape positions similar to those of the Marseilles soil

Similar soils:
• Soils that contain more clay
• Soils that have calcareous shale
• Soils that are underlain by sand, sandstone, or limestone

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• Contour farming and stripcropping in combination with a conservation tillage system that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Wetness, the shrink-swell potential, and the slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Seepage and wetness

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 3A

549F—Marseilles silt loam, 18 to 30 percent slopes

Composition

Marseilles and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Parent material: Loess and shale
Runoff: Rapid
Available water capacity: Low
Seasonal high water table: Perched at a depth of 1.5 to 3.5 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 4 inches—dark grayish brown silt loam

Subsurface layer:
4 to 8 inches—brown silt loam

Subsoil:
8 to 15 inches—yellowish brown silty clay loam
15 to 28 inches—mixed brown and greenish gray silty clay loam

Bedrock:
28 to 60 inches—soft shale

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils, which

formed in glacial till and are on the upper side slopes
• Elco soils, which formed in loess over glacial till and are on the upper side slopes
• The well drained Hickory soils, which formed in glacial till and are on the upper side slopes or in landscape positions similar to those of the Marseilles soil

Similar soils:
• Soils that have more clay
• Soils that are underlain by sand, sandstone, or limestone
• Soils that are eroded and have a surface layer of silty clay loam

Use and Management

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Using a no-till method of seeding or pasture renovation helps to establish forage species and control erosion.
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Woodland

Management concerns: Erosion, equipment limitations, and plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Wildlife habitat

Management concerns: Slope
Management measures:
• This soil is suited to grain and seed crops, wild herbaceous plants, and hardwood trees.
• The habitat should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Wetness, the shrink-swell potential, and the slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Seepage and wetness

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R

549G—Marseilles silt loam, 30 to 60 percent slopes

Composition

Marseilles and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Woodland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Parent material: Loess and shale
Runoff: Rapid
Available water capacity: Low
Seasonal high water table: Perched at a depth of 1.5 to 3.5 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 5 inches—very dark grayish brown silt loam

Subsurface layer:
5 to 9 inches—dark grayish brown silt loam

Subsoil:
9 to 13 inches—yellowish brown silty clay loam
13 to 28 inches—grayish brown, mottled silty clay loam

Bedrock:
28 to 60 inches—soft shale

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils, which formed in glacial till and are on the upper side slopes
• Elco soils, which formed in loess over glacial till and are on the upper side slopes
• The well drained Hickory soils, which formed in glacia till and are on the upper side slopes or in landscape positions similar to those of the Marseilles soil

Similar soils:
• Soils that have more clay
• Soils that are underlain by sand, sandstone, or limestone

• Soils that are eroded and have a surface layer of silty clay loam

Use and Management

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Seeding, fertilizing, and spraying by airplane or by hand help to control erosion.
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Woodland

Management concerns: Erosion, equipment limitations, and plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.
• Machinery should be used only when the soil is firm enough to support the equipment.

Wildlife habitat

Management concerns: Slope
Management measures:
• This soil is suited to grain and seed crops, wild herbaceous plants, and hardwood trees.
• The habitat should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Wetness, the shrink-swell potential, and the slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Seepage and wetness

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 3R

567D3—Elkhart silty clay loam, 8 to 15 percent slopes, severely eroded

Composition

Elkhart and similar soils: 92 to 97 percent
Contrasting inclusions: 3 to 8 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown silty clay loam
Subsoil:
8 to 24 inches—yellowish brown and dark yellowish brown silty clay loam
24 to 31 inches—brown, mottled silt loam
Substratum:
31 to 60 inches—light brownish gray and brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
• Small, isolated areas of sandy outwash
Similar soils:
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have free lime within a depth of 20 inches
• Soils in which the subsoil formed in glacial till

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• The hazard of further water erosion is severe if this soil is used for cultivated crops.
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green

manure or animal manure help to maintain productivity, improve tilth, minimize crusting, and increase the rate of water infiltration.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management measures:
• Installing filter lines on the contour helps to distribute the effluent evenly.
• Onsite investigation is needed.

Interpretive Groups

Land capability classification: IVe

802B—Orthents, loamy, gently sloping

Composition

Orthents and similar soils: 85 to 100 percent
Contrasting inclusions: 0 to 15 percent

Setting

Landform position: Soil areas disturbed by cutting and filling operations
Landscape: Uplands
Major uses: Highway and railroad right-of-ways, landfill, and other borrow areas

Soil Properties and Qualities

Slope: 1 to 7 percent
Drainage class: Somewhat poorly drained to moderately well drained
Permeability: Variable
Parent material: Loess or till
Runoff: Slow or medium
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Low
Erosion hazard: Moderate
Shrink-swell potential: Moderate or high
Potential for frost action: High

Inclusions

Contrasting inclusions:
• Areas occupied by school buildings, parking lots, and highways
• Areas of undisturbed Muscatine, Sable, and Tama soils
• Areas of escarpments associated with cut and fill areas

Similar soils:
• Soils that are covered with as much as 2 feet of coarser textured fill material, including gravel and stones
• Soils that have material underlain by shale

Use and Management

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.

Dwellings

Suitability: Unsuited
Management concerns: Compaction, wetness, and stoniness

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Compaction, wetness, and stoniness

Interpretive Groups

Land capability classification: Not assigned

864—Pits, quarries

Setting

Landform position: Variable
Landscape: Uplands
Major use: Active quarry operations
Remarks:
• Reclaiming areas of this unit by grading, shaping, and covering barren areas with soil material increases the number of potential uses.
• The feasibility and extent of reclamation depend on the desired alternative use and individual site conditions.

Soil Properties and Qualities

Permeability: Variable
Runoff: Rapid in the more sloping areas and ponded in the depressions
Parent material:
• The parent material is consolidated or excavated bedrock. The bedrock is primarily limestone, but shale is included. In places, the bedrock is mixed with varying amounts of the overlying loess, glacial till, or residuum.

Inclusions

Similar inclusions:
• Quarry company roads, stockpiles of crushed limestone, and sparsely vegetated spoil material and abandoned excavations, some of which are filled with water

Interpretive Groups

Land capability classification: Not assigned

895E—Fayette-Westville complex, 12 to 20 percent slopes

Composition

Fayette and similar soils: 30 to 60 percent
Westville and similar soils: 30 to 60 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major uses: Pasture and woodland

Soil Properties and Qualities

Fayette
Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Westville
Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Fayette
Surface layer:
0 to 2 inches—very dark grayish brown silt loam

Subsurface layer:
2 to 14 inches—dark grayish brown and brown silt loam

Subsoil:
14 to 60 inches—yellowish brown silty clay loam and silt loam

Westville
Surface layer:
0 to 5 inches—brown loam

Subsoil:
5 to 20 inches—dark brown clay loam
20 to 48 inches—reddish brown clay loam
48 to 54 inches—mixed dark brown and strong brown clay loam

Substratum:
54 to 60 inches—mixed dark brown and strong brown loam

Inclusions

Contrasting inclusions:
• Small areas of rock outcrop near the base of slopes
• The somewhat poorly drained Lawson and Orion soils on flood plains

Similar soils:
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have 20 to 60 inches of loess over till
• Soils that have bedrock below a depth of 40 inches

Use and Management

Cropland

Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.
• Using a no-till method of seeding or pasture renovation helps to establish forage species and control erosion.

Woodland

Management concerns: Erosion, equipment limitations, and seedling mortality
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Dwellings

Suitability: Unsuited
Management concerns: Slope

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Slope

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4R

936D2—Fayette-Hickory complex, 10 to 18 percent slopes, eroded

Composition

Fayette and similar soils: 40 to 60 percent
Hickory and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Pasture

Soil Properties and Qualities

Fayette
Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Hickory
Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Fayette
Surface layer:
0 to 4 inches—mixed very dark grayish brown and yellowish brown silt loam
Subsurface layer:
4 to 8 inches—mixed very dark grayish brown and yellowish brown silt loam
Subsoil:
8 to 36 inches—yellowish brown and dark yellowish brown silty clay loam
36 to 60 inches—brown and dark yellowish brown silty clay loam

Hickory
Surface layer:
0 to 8 inches—mixed brown and dark yellowish brown silt loam
Subsurface layer:
8 to 12 inches—mixed brown and dark yellowish brown silt loam
Subsoil:
12 to 33 inches—yellowish brown and dark yellowish brown clay loam
33 to 51 inches—brown and yellowish brown clay loam
Substratum:
51 to 60 inches—yellowish brown clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils, which formed predominantly in clayey glacial till and are between areas of the Fayette and Hickory soils
• Small, isolated areas of sandy outwash

Similar soils:
• Soils that formed in loess and clayey glacial till

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Erosion
Management measures:
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, and minimize crusting.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Erosion, equipment limitations, and seedling mortality
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.

Dwellings

Management concerns: Slope and the shrink-swell potential
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Management concerns: Slope and the moderate permeability
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: Fayette—4A; Hickory—5A

936G—Fayette-Hickory complex, 18 to 50 percent slopes

Composition

Fayette and similar soils: 40 to 60 percent
Hickory and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Woodland

Soil Properties and Qualities

Fayette
Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Hickory
Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High

Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Fayette
Surface layer:
0 to 4 inches—dark grayish brown silt loam
Subsurface layer:
4 to 10 inches—grayish brown silt loam
Subsoil:
10 to 32 inches—yellowish brown silty clay loam
32 to 60 inches—yellowish brown, mottled silty clay loam

Hickory
Surface layer:
0 to 4 inches—very dark grayish brown silt loam
Subsurface layer:
4 to 10 inches—brown silt loam
Subsoil:
10 to 43 inches—yellowish brown and dark yellowish brown clay loam
43 to 50 inches—brown, mottled clay loam
Substratum:
50 to 60 inches—brown, mottled loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils, which formed predominantly in clayey glacial till and are between areas of the Fayette and Hickory soils
• Small, isolated areas of sandy outwash
Similar soils:
• Soils that formed in loess over clayey glacial till
• Soils that have a thinner solum and are calcareous in the underlying material

Use and Management

Pasture and hay
Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Seeding, fertilizing, and spraying by airplane or by hand help to control erosion.

Woodland
Management concerns: Erosion and equipment limitations
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• New stands should be protected from fire and from grazing by livestock.
• Machinery should be used only when the soil is firm enough to support the equipment.

Wildlife habitat
Management concerns: Slope
Management measures:
• These soils are suited to grain and seed crops, wild herbaceous plants, and hardwood trees.
• The habitat should be protected from fire and from grazing by livestock.

Dwellings
Suitability: Unsuited
Management concerns: Slope

Septic tank absorption fields
Suitability: Unsuited
Management concerns: Slope

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Fayette—4R; Hickory—5R

943D3—Seaton-Timula complex, 10 to 18 percent slopes, severely eroded

Composition

Seaton and similar soils: 40 to 50 percent
Timula and similar soils: 40 to 50 percent
Contrasting inclusions: 0 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Seaton
Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe

Shrink-swell potential: Low
Potential for frost action: High

Timula
Drainage class: Well drained
Permeability: Moderate
Parent material: Loess
Runoff: Rapid
Available water capacity: High
Seasonal high water table: At a depth of more than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Seaton
Surface layer:
0 to 7 inches—brown and brownish yellow silt loam
Subsoil:
7 to 50 inches—yellowish brown silt loam and silt
Substratum:
50 to 60 inches—mixed yellowish brown and light brownish gray silt

Timula
Surface layer:
0 to 5 inches—brown silt loam
Subsoil:
5 to 16 inches—light yellowish brown silt loam
16 to 23 inches—yellowish brown silt
Substratum:
23 to 60 inches—mixed yellowish brown and pale yellow silt

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
Similar soils:
• Soils that are calcareous throughout

Use and Management

Cropland
Suitability: Poorly suited
Management concerns: Erosion
Management measures:
• The hazard of further water erosion is severe if these soils are used for cultivated crops.
• Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
• A rotation dominated by forage crops helps to control erosion.
• Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, minimize crusting, and increase the rate of water infiltration.

Pasture and hay
Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland
Management concerns: Plant competition
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• The woodland should be protected from fire and from grazing by livestock.

Dwellings
Management concerns: Slope
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.

Septic tank absorption fields
Management concerns: Slope
Management measures:
• Installing filter lines on the contour helps to distribute the effluent evenly.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Seaton—6A; Timula—4A

957D2—Elco-Atlas complex, 10 to 15 percent slopes, eroded

Composition

Elco and similar soils: 40 to 60 percent
Atlas and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Elco
Drainage class: Moderately well drained
Permeability: Moderate in the upper part; moderately slow in the lower part
Parent material: Loess and glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: Perched at a depth of 2.5 to 4.5 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Atlas
Drainage class: Somewhat poorly drained
Permeability: Very slow
Parent material: Glacial till
Runoff: Rapid
Available water capacity: Moderate
Seasonal high water table: Perched at a depth of 1 to 2 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Elco
Surface layer:
0 to 4 inches—mixed dark grayish brown and dark yellowish brown silt loam

Subsurface layer:
4 to 7 inches—mixed brown and dark yellowish brown silt loam

Subsoil:
7 to 25 inches—dark yellowish brown silty clay loam
25 to 60 inches—dark yellowish brown and brown, mottled silty loam clay and clay

Atlas
Surface layer:
0 to 3 inches—brown silt loam

Subsurface layer:
3 to 7 inches—brown silt loam

Subsoil:
7 to 28 inches—dark grayish brown and grayish brown, mottled clay
28 to 60 inches—olive gray and light olive gray, mottled clay

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Orion soils on flood plains
- Small, isolated areas of sandy outwash

Similar soils:
- Soils that have a darker surface layer
- Soils that formed in loamy glacial till
- Soils that formed entirely in loess
- Soils that have free lime in the lower part of the loess
- Soils that have slopes of less than 10 percent

Use and Management

Cropland

Suitability: Moderately suited
Management concerns: Erosion
Management measures:
- Contour farming, stripcropping, and terraces combined with a system of conservation tillage that leaves crop residue on the surface after planting help to control erosion.
- A rotation dominated by forage crops helps to control erosion.
- Returning crop residue to the soil and adding green manure or animal manure help to maintain productivity, improve tilth, minimize crusting, and increase the rate of water infiltration.

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion
Management measures:
- Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
- Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
- Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Seedling mortality and windthrow
Management measures:
- Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
- In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.

• The woodland should be protected from fire and from grazing by livestock.

Dwellings

Management concerns: Slope, wetness, and the shrink-swell potential
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness and the restricted permeability
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing filter lines on the contour helps to distribute the effluent evenly.
• Installing tile drains around the absorption field helps to lower the water table

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Elco—4A; Atlas—4C

957D3—Elco-Atlas complex, 10 to 18 percent slopes, severely eroded

Composition

Elco and similar soils: 40 to 60 percent
Atlas and similar soils: 30 to 50 percent
Contrasting inclusions: 0 to 10 percent

Setting

Landform position: Side slopes
Landscape: Uplands
Major use: Cropland

Soil Properties and Qualities

Elco

Drainage class: Moderately well drained
Permeability: Moderately slow
Parent material: Loess and glacial till
Runoff: Rapid
Available water capacity: High
Seasonal high water table: Perched at a depth of 2.5 to 4.5 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Atlas

Drainage class: Somewhat poorly drained
Permeability: Very slow
Parent material: Glacial till
Runoff: Rapid
Available water capacity: Moderate
Seasonal high water table: Perched at a depth of 1 to 2 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Elco

Surface layer:
0 to 7 inches—mixed dark grayish brown and yellowish brown silty clay loam

Subsoil:
7 to 27 inches—yellowish brown and dark yellowish brown silty clay loam
27 to 39 inches—yellowish brown and light olive brown silty clay loam
39 to 60 inches—grayish brown, yellowish brown, and light brownish gray clay loam

Atlas

Surface layer:
0 to 6 inches—brown clay loam

Subsoil:
6 to 34 inches—grayish brown and light olive gray, mottled clay
34 to 52 inches—mixed olive gray and light gray, mottled clay
52 to 60 inches—light olive gray, mottled clay

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Orion soils on flood plains
• Small, isolated areas of sandy outwash

Similar soils:
• Soils that formed in loamy glacial till
• Soils that formed entirely in loess
• Soils that have free lime in the lower part of the loess
• Soils that have slopes of less than 10 percent

Use and Management

Pasture and hay

Suitable species: Bromegrass, orchardgrass, tall fescue, and alfalfa
Management concerns: Erosion

Management measures:
• Deferred grazing helps to prevent overgrazing and thus minimizes surface compaction, excessive runoff, and the hazard of erosion.
• Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion.
• Except for purposes of weed control, plants should not be grazed or clipped until they are sufficiently established.

Woodland

Management concerns: Seedling mortality and windthrow
Management measures:
• Laying out logging roads and skid trails on the contour and seeding bare areas to grass or a grass-legume mixture help to control erosion.
• In openings where timber has been harvested, competition from undesirable species can be controlled by chemical or mechanical means.
• The woodland should be protected from fire and from grazing by livestock.

Wildlife habitat

Management concerns: None
Management measures:
• These soils are suited to grain and seed crops, wild herbaceous plants, and hardwood trees.
• The habitat should be protected from fire and from grazing by livestock.

Dwellings

Management concerns: Slope, wetness, and the shrink-swell potential
Management measures:
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.
• Installing tile drains near the foundations helps to lower the water table.

Septic tank absorption fields

Management concerns: Wetness and the restricted permeability
Management measures:
• Increasing the size of the filter field or replacing the soil with more permeable material improves the treatment of effluent.
• Installing filter lines on the contour helps to distribute the effluent evenly.
• Installing tile drains around the absorption field helps to lower the water table.

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: Elco—4A; Atlas—4C

3074—Radford silt loam, frequently flooded

Composition

Radford and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landscape: Flood plains
Landform: Low areas (first bottom)
Flooding frequency: Frequent
Flooding duration: Brief
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Silty alluvium
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: Moderate
Erosion hazard: None or slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—very dark gray silt loam
Subsurface layer:
7 to 12 inches—very dark gray silt loam
Substratum:
12 to 32 inches—stratified very dark grayish brown, very dark gray, brown, and grayish brown, mottled silt loam
32 to 46 inches—black silty clay loam
46 to 60 inches—mixed very dark gray and dark grayish brown, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The poorly drained Sawmill and Zook soils, which contain more clay in the surface layer than the Radford soil
• Soils that are only occasionally flooded
Similar soils:
• Soils that have a buried soil at a depth of more than 40 inches
• Soils that have a lighter colored surface soil

Use and Management

Cropland

Suitability: Well suited

Management concerns: Wetness
Management measures:
• Maintaining the existing subsoil or surface drainage system reduces wetness.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining the drainage system helps to lower the water table.

Wildlife habitat

Management concerns: None
Management measures:
• Areas of this soil provide habitat and a water supply for wildlife.
• The habitat should be protected from fire and from grazing by livestock.
• The grain and seed crops, grasses and legumes, and wild herbaceous plants used as food and cover by openland wildlife grow well on this soil.

Dwellings

Suitability: Unsuited
Management concerns: Wetness and flooding

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Wetness and flooding

Interpretive Groups

Land capability classification: IIIw

3107—Sawmill silty clay loam, frequently flooded

Composition

Sawmill and similar soils: 92 to 98 percent
Contrasting inclusions: 2 to 8 percent

Setting

Landscape: Flood plains
Landform: Low areas (first bottom)
Flooding frequency: Frequent
Flooding duration: Brief
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderate
Parent material: Silty alluvium
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At the surface to 2 feet below the surface
Organic matter content: High
Erosion hazard: None or slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 9 inches—very dark gray silty clay loam

Subsurface layer:
9 to 30 inches—very dark gray, mottled silty clay loam

Subsoil:
30 to 45 inches—dark gray, grayish brown, and dark grayish brown, mottled silty clay loam

Substratum:
45 to 60 inches—grayish brown, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Lawson, Orion, and Radford soils, which contain less clay in all or part of the solum than the Sawmill soil
• Areas of soils that are only occasionally flooded

Similar soils:
• Soils that have more clay in the surface layer and subsoil
• Soils that have a thicker surface layer

Use and Management

Cropland

Suitability: Moderate
Management concerns: Wetness
Management measures:
• Maintaining the existing subsoil or surface drainage system reduces wetness.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, and adding green manure or animal manure maintain productivity, improve tilth, and minimize compaction.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Erosion

Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining the drainage system helps to lower the water table.
• Deferring grazing when the soil is too wet minimizes surface compaction and helps to maintain tilth.

Wildlife habitat

Management concerns: None
Management measures:
• Areas of this soil provide habitat and a water supply for wildlife.
• The habitat should be protected from fire and from grazing by livestock.
• The grain and seed crops, grasses and legumes, and wild herbaceous plants used as food and cover by openland wildlife grow well on this soil.

Dwellings

Suitability: Unsuited
Management concerns: Wetness and flooding

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Wetness and flooding

Interpretive Groups

Land capability classification: IIIw

3107+—Sawmill silt loam, overwash

Composition

Sawmill and similar soils: 92 to 98 percent
Contrasting inclusions: 2 to 8 percent

Setting

Landscape: Flood plains
Landform: Low areas (first bottom)
Flooding frequency: Frequent
Flooding duration: Brief
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderate
Parent material: Silty alluvium
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At the surface to 2 feet below the surface
Organic matter content: High
Erosion hazard: None or slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 11 inches—very dark grayish brown silt loam

Subsurface layer:
11 to 36 inches—black and very dark gray silty clay loam

Subsoil:
36 to 53 inches—mixed dark gray and olive gray, mottled silty clay loam

Substratum:
53 to 60 inches—olive gray, mottled clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Lawson, Orion, and Radford soils, which contain less clay in all or part of the solum than the Sawmill soil

Similar soils:
• Soils that have more clay in the surface layer and subsoil
• Soils that have a thicker surface layer
• Areas of soils that are only occasionally flooded

Use and Management

Cropland

Suitability: Moderate
Management concerns: Wetness
Management measures:
• Maintaining the existing subsoil or surface drainage system reduces wetness.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining the drainage system helps to lower the water table.
• Deferring grazing when the soil is too wet minimizes surface compaction and helps to maintain tilth.

Wildlife habitat

Management concerns: None
Management measures:
• Areas of this soil provide habitat and a water supply for wildlife.

• The habitat should be protected from fire and from grazing by livestock.
• The grain and seed crops, grasses and legumes, and wild herbaceous plants used as food and cover by openland wildlife grow well on this soil.

Dwellings

Suitability: Unsuited
Management concerns: Wetness and flooding

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Wetness and flooding

Interpretive Groups

Land capability classification: IIIw

3405—Zook silty clay loam, frequently flooded

Composition

Zook and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landscape: Flood plains
Landform: Low areas (first bottom)
Flooding frequency: Frequent
Flooding duration: Brief
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Slow
Parent material: Clayey alluvium
Runoff: Very slow
Available water capacity: Moderate
Seasonal high water table: At the surface to 3 feet below the surface
Organic matter content: High
Erosion hazard: None or slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—black silty clay loam

Subsurface layer:
8 to 22 inches—very dark gray silty clay

Subsoil:
22 to 55 inches—very dark gray and dark gray, mottled silty clay
55 to 60 inches—olive gray, mottled silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Radford and Lawson soils, which contain less clay than the Zook soil
• Areas of soils that are only occasionally flooded

Similar soils:
• Soils that have less clay
• Soils that have up to 20 inches of silt loam overwash

Use and Management

Cropland

Suitability: Moderate
Management concerns: Wetness
Management measures:
• Maintaining the existing subsoil or surface drainage system reduces wetness.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, and adding green manure or animal manure maintain productivity, improve tilth, and minimize compaction.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining the drainage system helps to lower the water table.
• Deferring grazing when the soil is too wet minimizes surface compaction and helps to maintain tilth.

Wildlife habitat

Management concerns: None
Management measures:
• Areas of this soil provide habitat and a water supply for wildlife.
• The habitat should be protected from fire and from grazing by livestock.
• The grain and seed crops, grasses and legumes, and wild herbaceous plants used as food and cover by openland wildlife grow well on this soil.

Dwellings

Suitability: Unsuited
Management concerns: Wetness, flooding, and the shrink-swell potential

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Wetness, the slow permeability, and flooding

Interpretive Groups

Land capability classification: IIIw

3415—Orion silt loam, frequently flooded

Composition

Orion and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landscape: Flood plains
Landform: Low areas (first bottom)
Flooding frequency: Frequent
Flooding duration: Brief
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Silty alluvium
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: Moderately low
Erosion hazard: None or slight
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 9 inches—mixed dark grayish brown and brown silt loam

Substratum:
9 to 36 inches—dark grayish brown, mottled silt loam and stratified light gray fine sand and silt
36 to 45 inches—very dark gray, mottled silty clay loam
45 to 60 inches—mixed very dark gray and dark grayish brown, mottled silty clay loam

Inclusions

Contrasting inclusions:
• Lawson soils, which have a darker surface layer than the Orion soil, do not have a buried soil, and are in landscape positions similar to those of the Orion soil
• The poorly drained Sawmill and Zook soils, which have a higher content of clay in the upper part of the profile than the Orion soil

Similar soils:
• Soils that have a thicker and darker surface layer
• Soils that have coarse sand or gravel in the profile
• Soils that have a buried soil at a depth of more than 40 inches
• Areas of soils that are only occasionally flooded

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness
Management measures:
• Maintaining the existing subsoil or surface drainage system reduces wetness.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth and minimizes crusting.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining the drainage system helps to lower the water table.

Wildlife habitat

Management concerns: None
Management measures:
• Areas of this soil provide habitat and a water supply for wildlife.
• The habitat should be protected from fire and from grazing by livestock.
• The grain and seed crops, grasses and legumes, and wild herbaceous plants used as food and cover by openland wildlife grow well on this soil.

Dwellings

Suitability: Unsuited
Management concerns: Wetness and flooding

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Wetness and flooding

Interpretive Groups

Land capability classification: IIIw

3451—Lawson silt loam, frequently flooded

Composition

Lawson and similar soils: 85 to 90 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landscape: Flood plains
Landform: Low areas (first bottom)
Flooding frequency: Frequent

Flooding duration: Brief
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Silty alluvium
Runoff: Slow
Available water capacity: Very high
Seasonal high water table: At a depth of 1 to 3 feet
Organic matter content: High
Erosion hazard: None or slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—black silt loam
Subsurface layer:
7 to 30 inches—black and very dark gray silt loam
Substratum:
30 to 43 inches—stratified very dark gray, very dark grayish brown, and dark grayish brown, mottled silt loam
43 to 60 inches—dark grayish brown, mottled silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Sawmill and Zook soils, which have a higher content of clay in the upper part of the profile than the Lawson soil
• Areas of soils that are only occasionally flooded
Similar soils:
• Soils that have a buried soil
• Soils that have a thinner surface layer

Use and Management

Cropland

Suitability: Well suited
Management concerns: Wetness
Management measures:
• Maintaining the existing subsoil or surface drainage system reduces wetness.
• Applying a system of conservation tillage that leaves crop residue on the surface after planting, including forage crops in the rotation, returning crop residue to the soil, or adding green manure or animal manure helps to maintain productivity and tilth.

Pasture and hay

Suitable species: Bromegrass, tall fescue, and alsike clover
Management concerns: Wetness
Management measures:
• Proper stocking rates, rotation grazing, and deferred grazing help to keep the pasture in good condition.
• Maintaining the drainage system helps to lower the water table.

Wildlife habitat

Management concerns: None
Management measures:
• Areas of this soil provide habitat and a water supply for wildlife.
• The habitat should be protected from fire and from grazing by livestock.
• The grain and seed crops, grasses and legumes, and wild herbaceous plants used as food and cover by openland wildlife grow well on this soil.

Dwellings

Suitability: Unsuited
Management concerns: Wetness and flooding

Septic tank absorption fields

Suitability: Unsuited
Management concerns: Wetness and flooding

Interpretive Groups

Land capability classification: IIIw

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with

water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures. In Warren County, most of the naturally wet soils have been adequately drained.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Most of the land in Warren County is farmed. In 1982, the county had 987 farms making up about 320,700 acres, or approximately 92 percent of the total land area. About 276,000 acres was used as cropland. Of this total, 173,400 acres was used for corn; 59,300 acres for soybeans; 18,200 acres for hayland; 16,400 acres for pasture; 4,600 acres for oats; and 500 acres for wheat (U.S. Department of Commerce, 1983). A few vegetable farms and orchards are also in the county.

In recent years, urban development on prime farmland and declining farm livestock production have resulted in an increase in the acreage of marginal land used for the production of row crops. This marginal land is generally more difficult to manage than other areas that are more suitable for farming.

The chief management concerns in the county are water erosion, soil blowing, wetness, tilth, fertility, and flooding.

Erosion reduces productivity, impairs tilth, and lowers the quality of surface water. As the surface layer is eroded away, sediment is deposited in drainageways, road ditches, streams, rivers, and lakes. Removing this sediment is expensive. Controlling erosion improves the quality of water for municipal and recreational uses and for fish and other wildlife.

Erosion is a hazard on all soils that have slopes of 2 percent or more. If these soils are cultivated, the hazard of erosion increases unless management measures that slow the movement of soil and water, increase the rate of water infiltration, and reduce the impact of raindrops are used. Fayette, Hickory, Rozetta, and Tama soils are

the major cropland soils in the county that are susceptible to erosion.

Soil wetness is a management concern on many of the soils in Warren County. The poorly drained Denny, Sable, and Sawmill soils are so wet that crop production generally is not feasible unless a drainage system is installed. Planting may be delayed during some years in areas of the somewhat poorly drained Ipava, Keomah, Muscatine, and Stronghurst soils unless these soils are adequately drained.

Soil blowing is a hazard during part of the winter and in early spring. The cropland soils in the county that are most susceptible to soil blowing are Muscatine, Sable, and Tama soils that have been fall plowed. Soil blowing reduces productivity and results in the sedimentation of waterways. Using conservation practices reduces the hazard of soil blowing.

Assumption and Elco soils formed in loess over firm, clayey glacial till. The clayey till restricts the downward movement of water. The water tends to perch on top of the till. As a result, seepage is a problem in areas on side slopes where the water surfaces. In these seepy areas, the wetness occasionally delays planting or harvesting.

Soil tilth is an important factor influencing the germination of seeds, the amount of runoff, and the rate of water infiltration. Maintaining a friable seedbed is especially difficult in areas of soils that have a plow layer of silty clay loam or finer textured material. The poorly drained Sable, Sawmill, and Zook soils are examples. These soils are sticky when wet and hard and cloddy when dry. As a result, preparing a good seedbed is difficult. Tilling at the proper moisture content and using equipment that has the lowest possible wheel weight per unit area of soil surface are important management measures in areas of these soils.

Tilth is a management concern in soils that are low in organic matter content and have weak structure in the surface layer, such as Fayette, Hickory, Rozetta, and Seaton soils. During periods of intensive rainfall, a crust forms on the surface of these soils. This crust is hard when dry. As a result, the rate of water infiltration is reduced and the runoff rate and the susceptibility to accelerated erosion are increased. Mechanical cultivation and crop residue management can improve soil tilth.

Tilth can be significantly reduced as a result of erosion. As erosion removes the surface layer of the soil, the more clayey subsoil is incorporated into the plow layer. The soil is then susceptible to clodding if it is worked when wet. Also, erosion reduces the content of organic matter in the soil, thereby increasing the likelihood of crusting. Tilth can be improved by applying management measures that increase the content of organic matter, reduce the runoff rate, and improve soil structure.

Soil fertility varies in the soils on uplands in Warren County. The forest soils, such as Fayette, Keomah, and Rozetta soils, are more acid in the subsoil and have a lower content of organic matter in the plow layer than the prairie soils, such as Ipava, Sable, and Tama soils. Radford, Sawmill, and other soils on flood plains are neutral to moderately alkaline throughout and have a naturally high content of plant nutrients. Soils that have been severely eroded and have lost most of their natural, nutrient-rich topsoil, such as some Tama and Fayette soils, are much less fertile than the uneroded and moderately eroded soils of the same series.

Flooding is a hazard on bottom land in the county. Some of the soils on flood plains are flooded by stream overflow almost yearly. Others are flooded during the growing season less frequently than once every 2 years. The flood-prone soils are better suited to crop varieties that require a relatively short growing season than to other varieties. They are also better suited to less intensive land uses, such as pasture and wildlife habitat. Conservation practices help to control runoff, increase the rate of water infiltration, maintain fertility, and reduce the hazard of erosion. The following paragraphs describe some of the conservation practices that are suitable for use in Warren County.

Providing an adequate plant cover and reducing the length of slopes help to control erosion and soil blowing. These measures also improve tilth and fertility. A cropping system that keeps a plant cover or crop residue on the surface during critical rainfall periods and that includes grasses and legumes helps to minimize soil losses. Such a system also improves tilth and provides nitrogen for the following crop.

Conservation tillage, contour farming, and contour stripcropping help to control erosion. Conservation tillage retains a protective cover of crop residue on the surface throughout the year. The crop residue protects the surface from the beating action of raindrops. Crop residue management also helps to prevent surface crusting and maintains tilth and thus reduces the hazard of erosion and provides a more friable seedbed. The residue also protects the surface from soil blowing. Contour farming is planting and tilling on the contour of the land. Contour stripcropping is alternating strips of a cultivated crop with strips of grasses or legumes and planting on the contour.

Terraces reduce the hazard of erosion by shortening the slopes and by controlling runoff. Terraces consist of a series of embankments or of ridges and channels that are properly spaced and graded so that they intercept surface runoff and conduct it to a stable outlet at a

nonerosive velocity. By varying the type and design, a suitable terrace system can be developed for most of the more sloping cropland soils in the county and especially for soils that have slopes of 2 to 10 percent. Grassed waterways and erosion-control structures also help to remove excess water at a nonerosive velocity.

All of the poorly drained and somewhat poorly drained soils in the county require an artificial drainage system for the efficient production of the major cultivated crops. Many areas have had a variety of drainage practices installed over the years. The systems in many areas are inadequate, old, or poorly designed. These areas would benefit from a new, efficient system designed to meet the needs of each specific kind of soil.

Standard tile lines function well in the moderately permeable or moderately slowly permeable soils if suitable outlets are available. Soils that have weak structure or a high content of clay may require closely spaced tile lines. A combination of tile lines and surface inlets or surface ditches may be needed for adequate drainage, particularly in poorly drained or slowly permeable soils, such as Zook soils.

In areas that are subject to overflow during the growing season, protection from flooding is needed. Levees or dikes can protect soils on adjacent flood plains. Applying conservation measures upstream reduces the runoff rate and minimizes overflow in areas downstream.

Soil blowing can be reduced by maintaining a winter cover crop, leaving crop residue on the surface during the winter, delaying plowing until spring, or keeping the soil surface rough. Windbreaks of suitable trees or shrubs also are effective in controlling soil blowing.

The combination of conservation practices needed for proper soil management depends on the soil characteristics and the topography. Information about the design of these practices is available at the office of the Warren County Soil and Water Conservation District.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents (Fehrenbacher and others, 1978). Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the

choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of the map units in this survey area is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

In 1982, about 4.3 percent of the acreage in Warren County was woodland. This acreage represents about 14.3 percent of the area that was wooded at the time the county was settled. Most of the woodland is along watercourses. The major native species along waterways are oak, elm, ash, hickory, black walnut, and maple. On the bottom land and along slopes, the native species include sycamore, locust, cottonwood, and dogwood.

Many of the areas that supported native timber have been cleared and are used for row crops. Most of the remaining woodland is in areas that are too wet, too steep, or too remote and isolated to be used for crops. Each year, some areas are cleared and the land is replanted.

Clearing the woodland can result in severe erosion in the steeper areas. The erosion results from the removal of the tree canopy and the accumulated leaf litter. When the protective cover of vegetation is removed, the surface of the soil is vulnerable to the impact of raindrops and the erosive force of runoff water. The hazard of erosion is very severe if these areas are used for farming; therefore, many of these areas are better suited to timber.

Harvesting of timber on private land is generally in areas of the steep or very steep Elco, Hickory, and Marseilles soils or in areas of soils on wet flood plains, such as Orion and Sawmill soils, that have not been disturbed for a number of years. Selective cutting of white oak, hickory, ash, and walnut for sawlogs is the most common harvest method.

Many of the existing stands can be improved by harvesting mature trees and trees of low value. Measures that protect the woodland from erosion, fire, and grazing are needed. Logging trails and access roads are commonly in areas of steep soils. Shaping and seeding these trails and roads and applying fertilizer immediately after harvest help to control erosion. Properly constructed water bars across the trails also help to control erosion. Interplanting is needed for maximum woodland production. Control or removal of competing vegetation is needed if seedlings are planted. A cover of grass is needed between rows of seedlings planted in bare, sloping areas.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol,* a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X,* stoniness or rockiness; *W,* excess water in or on the soil; *T,* toxic substances in the soil; *D,* restricted rooting depth; *C,* clay in the upper part of the soil; *S,* sandy texture; *F,* a high content of rock fragments in the soil; and *N,* snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

In table 7, *slight, moderate,* and *severe* indicate the

degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *productivity class*. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *productivity class*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on

measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The major recreational facilities in Warren County include Citizens Lake, Lake Warren, Little Swan Lake, Young's Lake, and many smaller lakes. Citizens Lake is the only lake in the county that is open to the public without a fee or membership.

The county has three 18-hole golf courses. These are Gibson Woods, Little Swan Lake, and Monmouth Country Club. Adjacent to the Gibson Woods course is Monmouth Park, which offers hiking trails, a baseball diamond, tennis courts, picnic areas, and an amphitheater.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Intensive agriculture has significantly reduced the wildlife habitat in Warren County over the past 150 years. Association 6, which is described under the heading "General Soil Map Units," has the largest remaining acreage of habitat for woodland wildlife species, such as whitetail deer, squirrels, and songbirds. Areas of cropland in associations 1, 2, 3, 4, and 5 provide food and cover for many types of openland wildlife, such as cottontail rabbit, raccoon, bobwhite quail, and mourning dove. Wet areas in

association 7 provide habitat for waterfowl, beavers, and muskrats. Some privately owned ponds throughout the county provide habitat for game fish, such as bass, bluegill, and crappie.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of

deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are

structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability

in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications

for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the

soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

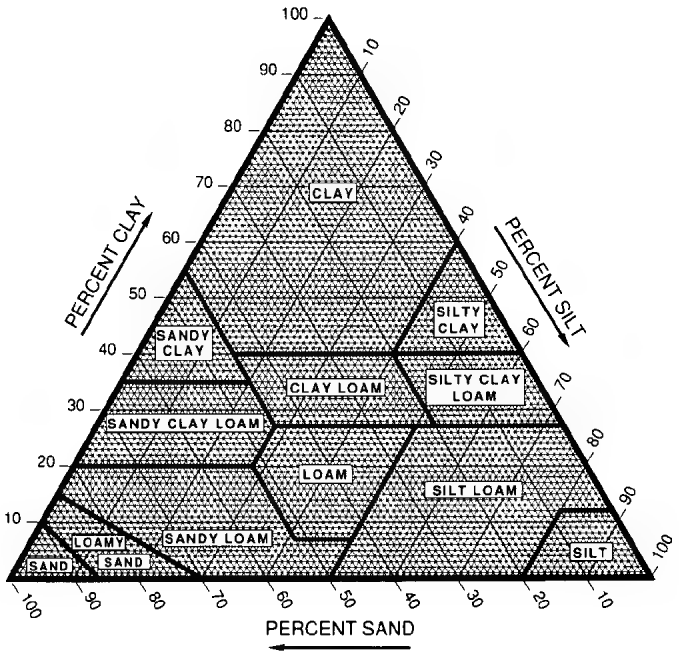


Figure 8.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 8). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified

as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory

analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Illinois Department of Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); and Moisture density—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Assumption Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part

Landscape: Uplands
Landform position: Side slopes
Parent material: Loess and glacial till
Slope range: 5 to 15 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Argiudolls
Taxadjunct features: The Assumption soils in this survey area have a thinner dark surface soil than is defined as the range for the series. They are classified as fine-silty, mixed, mesic Mollic Hapludalfs.

Typical Pedon

Assumption silt loam, 5 to 18 percent slopes, eroded, 700 feet west and 2,280 feet south of the northeast corner of sec. 29, T. 8 N., R. 1 W.

Ap—0 to 8 inches; mixed very dark grayish brown (10YR 3/2) and brown (10YR 4/3) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

Bt1—8 to 20 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; common faint dark brown (10YR 3/3) clay films on faces of peds; few faint very dark grayish brown (10YR 3/2) organic coatings in root channels; slightly acid; clear smooth boundary.

Bt2—20 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; many faint dark brown (10YR 3/3) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt3—26 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; few medium faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; moderately acid; clear smooth boundary.

2Btg1—32 to 44 inches; dark grayish brown (2.5Y 4/2) silty clay loam; common fine distinct brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm; many faint very dark grayish brown (2.5Y 3/2) clay films on faces of peds; about 2 percent gravel; moderately acid; gradual smooth boundary.

2Btg2—44 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay; common medium prominent dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; firm; many faint very dark grayish brown (2.5Y 3/2) clay films on faces of peds; about 3 percent gravel; moderately acid.

Range in Characteristics

Depth to carbonates: More than 60 inches
Depth to bedrock: More than 60 inches
Thickness of the loess: 20 to 40 inches

2Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 to 6

Atlas Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Very slow
Landscape: Uplands
Landform position: Side slopes
Parent material: Glacial till
Slope range: 10 to 18 percent
Taxonomic class: Fine, montmorillonitic, mesic, sloping Aeric Ochraqualfs

Typical Pedon

Atlas clay loam, in an area of Elco-Atlas complex, 10 to 18 percent slopes, severely eroded, 900 feet south and 1,500 feet west of the northeast corner of sec. 6, T. 12 N., R. 2 W.

Ap—0 to 6 inches; brown (10YR 4/3) clay loam, pale brown (10YR 6/3) dry; strong medium subangular blocky structure; firm; moderately acid; abrupt smooth boundary.

Btg1—6 to 20 inches; grayish brown (10YR 5/2) clay; few medium distinct dark yellowish brown (10YR 4/4) mottles; strong medium angular blocky structure; firm; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; few faint very dark gray (10YR 3/1) krotovinas; few prominent dark stains of iron and manganese oxides; moderately acid; clear smooth boundary.

Btg2—20 to 34 inches; light olive gray (5Y 6/2) clay; few fine prominent dark yellowish brown (10YR 4/6) mottles; moderate coarse prismatic structure parting to strong medium angular blocky; firm; common distinct grayish brown (2.5Y 5/2) clay films on faces of peds; few prominent very dark gray (10YR 3/1) krotovinas; many prominent dark stains of iron and manganese oxides; moderately acid; clear wavy boundary.

Btg3—34 to 52 inches; mixed olive gray (5Y 5/2) and light gray (5Y 7/1) clay; few fine prominent dark yellowish brown (10YR 4/6) mottles; strong medium angular blocky structure; firm; common faint olive gray (5Y 4/2) clay films on faces of peds; many prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

BCg—52 to 60 inches; light olive gray (5Y 6/2) clay; common medium faint olive (5Y 5/3) and light gray (5Y 7/1) mottles; moderate medium subangular blocky structure; firm; few faint olive gray (5Y 5/2)

clay films on vertical faces of peds; many prominent dark stains of iron and manganese oxides; moderately acid.

Range in Characteristics

Ap horizon:
Value—3 or 4
Chroma—1 to 3

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam, silty clay, clay, or clay loam

Atterberry Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Uplands
Landform position: Wide ridges and flats
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Udollic Ochraqualfs

Typical Pedon

Atterberry silt loam, 0 to 2 percent slopes, 60 feet south and 880 feet west of the northeast corner of sec. 19, T. 9 N., R. 3 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 13 inches; grayish brown (10YR 5/2) silt loam; weak thin and medium platy structure; friable; common faint very dark gray (10YR 3/1) wormcasts; neutral; abrupt smooth boundary.

BE—13 to 16 inches; brown (10YR 5/3) silt loam; weak fine and medium subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) organic coatings on faces of peds; few prominent dark stains of iron and manganese oxides; slightly acid; clear smooth boundary.

Bt1—16 to 29 inches; brown (10YR 4/3) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/8) and few medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; common distinct very dark gray (10YR 3/1) organic castings; few prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

Bt2—29 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium and coarse prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; common faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; clear wavy boundary.

BCg—40 to 50 inches; light olive gray (5Y 6/2) silty clay loam; many medium and coarse prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable; few faint olive gray (5Y 5/2) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

Cg—50 to 60 inches; light olive gray (5Y 6/2) silt loam; many medium and coarse prominent strong brown (7.5YR 5/8) mottles; massive; friable; many prominent dark stains and concretions of iron and manganese oxides; slightly acid.

Range in Characteristics

Thickness of the loess: 60 to more than 80 inches

E horizon:
Value—4 to 6
Chroma—1 or 2

Bt horizon:
Value—4 to 6
Chroma—2 to 4
Texture—silty clay loam or silt loam
Content of clay—27 to 35 percent in the upper part

BC and C horizons:
Value—5 or 6
Chroma—1 or 2

Clarksdale Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landscape: Uplands
Landform position: Wide ridges and flats
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine, montmorillonitic, mesic Udollic Ochraqualfs

Typical Pedon

Clarksdale silt loam, 0 to 2 percent slopes, 660 feet west and 1,460 feet south of the northeast corner of sec. 26, T. 12 N., R. 1 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 13 inches; dark gray (10YR 4/1) silt loam; weak medium and thick platy structure; friable; neutral; clear smooth boundary.

EB—13 to 16 inches; dark grayish brown (10YR 4/2) silt loam; weak medium platy structure parting to moderate fine subangular blocky; friable; neutral; clear smooth boundary.

Bt—16 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; many faint grayish brown (10YR 5/2) clay films and many faint very dark gray (10YR 3/1) organic coatings on faces of peds; common prominent dark stains of iron and manganese oxides; slightly acid; gradual smooth boundary.

Btg1—24 to 34 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; common distinct grayish brown (10YR 5/2) clay films on faces of peds; common prominent very dark gray (10YR 3/1) organic coatings in root channels; common prominent dark stains of iron and manganese oxides; slightly acid; clear smooth boundary.

Btg2—34 to 44 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8 and 4/6) mottles; moderate fine prismatic structure; friable; common distinct grayish brown (10YR 5/2) clay films on faces of peds; common distinct dark gray (10YR 4/1) organic coatings in root channels; common prominent dark stains of iron and manganese oxides; slightly acid; gradual smooth boundary.

BCg—44 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent strong brown (7.5YR 5/8 and 4/6) mottles; weak medium angular blocky structure; friable; common prominent dark gray (10YR 4/1) organic coatings in root channels; common prominent dark stains of iron and manganese oxides; slightly acid.

Range in Characteristics

Ap horizon:
Value—2 or 3
Chroma—1 or 2

E horizon:
Value—4 to 6

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Chroma—2 or 3
Texture—silty clay loam or silty clay
Content of clay—35 to 40 percent in the upper part

Denny Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landscape: Uplands
Landform position: Depressions
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine, montmorillonitic, mesic Mollic Albaqualfs
Taxadjunct features: The Denny soils in this survey area do not have an abrupt textural change between the E and Bt horizons. They are classified as fine, montmorillonitic, mesic Mollic Ochraqualfs.

Typical Pedon

Denny silt loam, 45 feet east and 1,320 feet north of the southwest corner of sec. 12, T. 8 N., R. 1 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

Eg—8 to 14 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate thick platy structure parting to weak fine subangular blocky; friable; common distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; clear smooth boundary.

BEg—14 to 17 inches; dark grayish brown (2.5Y 4/2) silt loam; common fine prominent dark yellowish brown (10YR 4/6) mottles; moderate medium platy structure parting to weak fine and medium subangular blocky; friable; common prominent light gray (10YR 7/2) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Btg1—17 to 23 inches; gray (5Y 5/1) silty clay loam; common fine prominent dark brown (7.5YR 4/4) and dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; friable; many faint dark gray (5Y 4/1) clay films on faces of peds; slightly acid; clear smooth boundary.

Btg2—23 to 33 inches; gray (5Y 5/1) silty clay; common medium prominent strong brown (7.5YR 5/8 and 4/6) mottles; moderate medium subangular blocky structure; friable; many faint dark gray (5Y 4/1) clay

films on faces of peds; slightly acid; gradual smooth boundary.

Btg3—33 to 45 inches; olive gray (5Y 5/2) clay loam; common medium prominent strong brown (7.5YR 5/8 and 4/6) and brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; many faint olive gray (5Y 4/2) clay films on faces of peds; common prominent dark gray (N 4/0) organic coatings in root channels and on contact planes; slightly acid; gradual smooth boundary.

BCg—45 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6 and 5/8) mottles; weak medium subangular blocky structure; friable; few faint olive gray (5Y 5/2) clay films on vertical faces of peds; common prominent dark gray (N 4/0) organic coatings; neutral.

Range in Characteristics

Ap horizon:
Value—2 or 3
Chroma—1 or 2

E horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2

Bt horizon:
Hue—2.5Y or 5Y
Value—4 to 6
Content of clay—35 to 40 percent in the upper part

Downs Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Ridgetops and side slopes
Parent material: Loess
Slope range: 2 to 10 percent
Taxonomic class: Fine-silty, mixed, mesic Mollic Hapludalfs

Typical Pedon

Downs silt loam, 2 to 5 percent slopes, 1,500 feet west and 1,500 feet north of the southeast corner of sec. 18, T. 8 N., R. 1 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

BE—7 to 13 inches; brown (10YR 4/3) silt loam; moderate medium platy structure; friable; few distinct light gray (10YR 7/1) silt coatings and many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; abrupt smooth boundary.

Bt1—13 to 21 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; common faint very dark grayish brown (10YR 3/2) clay films and common distinct black (10YR 2/1) organic coatings and light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt2—21 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine faint brown (10YR 5/3) and few fine distinct grayish brown (10YR 5/2) mottles; few medium prominent light brownish gray (2.5Y 6/2) mottles in the lower part; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films and common distinct black (10YR 2/1) organic coatings and light gray (10YR 7/1) silt coatings on faces of peds; moderately acid; gradual smooth boundary.

Bt3—31 to 48 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2), few fine faint brown (10YR 5/3), and common medium prominent light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films and common distinct light gray (10YR 7/1) silt coatings on faces of peds; common distinct black (10YR 2/1) organic coatings in root channels; moderately acid; clear smooth boundary.

BC—48 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films and common distinct light gray (10YR 7/1) silt coatings on faces of peds; common distinct black (10YR 2/1) organic coatings in root channels; moderately acid.

Range in Characteristics

Ap horizon:
Value—2 or 3
Chroma—1 or 2

E horizon:
Value—3 to 5
Chroma—2 or 3

Bt horizon:
Value—4 or 5
Chroma—3 to 5
Texture—silty clay loam or silt loam
Content of clay—27 to 35 percent in the upper part

Dunbarton Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Slow
Landscape: Uplands
Landform position: Side slopes
Parent material: Loess and clayey residuum
Slope range: 20 to 60 percent
Taxonomic class: Clayey, montmorillonitic, mesic Lithic Hapludalfs

Typical Pedon

Dunbarton silt loam, 20 to 60 percent slopes, 500 feet east and 2,600 feet north of the southwest corner of sec. 4, T. 11 N., R. 3 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

E—2 to 4 inches; brown (10YR 5/3) silt loam; weak thin platy structure; friable; about 1 percent gravel; moderately acid; abrupt smooth boundary.

BE—4 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; many distinct light gray (10YR 7/2) silt grains and coatings; about 5 percent gravel; moderately acid; clear wavy boundary.

2Bt—10 to 16 inches; reddish brown (5YR 4/3) silty clay; strong medium subangular blocky structure; firm; common faint reddish brown (5YR 4/3) clay films on faces of peds; about 10 percent gravel and flagstones; neutral; abrupt smooth boundary.

3R—16 inches; limestone bedrock.

Range in Characteristics

Depth to bedrock: 12 to 20 inches
Thickness of the loess: 0 to 15 inches

A horizon:
Value—3 or 4

E horizon:
Value—4 or 4
Chroma—2 or 3

2Bt horizon:
Hue—5YR or 7.5YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay or clay

Elco Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Landscape: Uplands
Landform position: Side slopes
Parent material: Loess and glacial till
Slope range: 10 to 20 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludalfs

Typical Pedon

Elco silt loam, 10 to 15 percent slopes, eroded, 740 feet south and 140 feet west of the northeast corner of sec. 20, T. 11 N., R. 1 W.

Ap—0 to 7 inches; mixed dark grayish brown (10YR 4/2) and brown (10YR 5/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

EB—7 to 11 inches; brown (10YR 5/3) silt loam; weak medium platy structure; friable; common distinct dark grayish brown (10YR 4/2) organic coatings; neutral; clear smooth boundary.

Bt1—11 to 23 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—23 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; clear smooth boundary.

2Bt3—34 to 43 inches; olive brown (2.5Y 4/4) clay; common fine prominent strong brown (7.5YR 4/6) mottles; strong medium and coarse subangular blocky structure; firm; common distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; few pebbles; moderately acid; gradual wavy boundary.

2Bt4—43 to 60 inches; olive brown (2.5Y 4/4) clay; common fine prominent strong brown (7.5YR 4/6) and yellowish brown (10YR 5/8) and common medium prominent olive gray (5Y 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds; few pebbles; slightly acid.

Range in Characteristics

Ap horizon:
Value—4 or 5
Chroma—2 to 4
Texture—silt loam or silty clay loam

E horizon:
Value—4 or 5
Chroma—3 or 4

2Bt horizon:
Hue—10YR or 2.5Y
Value—4 or 5
Chroma—3 to 6

Elkhart Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Side slopes
Parent material: Loess
Slope range: 8 to 15 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Argiudolls
Taxadjunct features: The Elkhart soils in this survey area have a thinner dark surface soil than is defined as the range for the series. They are classified as fine-silty, mixed, mesic Mollic Hapludalfs.

Typical Pedon

Elkhart silty clay loam, 8 to 15 percent slopes, severely eroded, 1,100 feet east and 1,200 feet south of the northwest corner of sec. 23, T. 11 N., R. 3 W.

Ap—0 to 8 inches; mixed very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/4) silty clay loam, dark grayish brown (10YR 4/2) and light yellowish brown (10YR 6/4) dry; moderate fine and medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bt1—8 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; many distinct dark yellowish brown (10YR 4/4) clay films and common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear wavy boundary.

Bt2—17 to 24 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; many distinct brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

BC—24 to 31 inches; brown (10YR 5/3) silt loam; many coarse distinct grayish brown (2.5Y 5/2) and common medium prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; strong effervescence; slightly alkaline; clear wavy boundary.

C—31 to 60 inches; light brownish gray (2.5Y 6/2) and brown (10YR 5/3) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; numerous concretions of lime; strong effervescence; slightly alkaline.

Range in Characteristics

Ap horizon:
Value—2 or 3
Chroma—2 or 3

Bt horizon:
Hue—10YR or 7.5YR
Chroma—3 to 6
Content of clay—27 to 35 percent in the upper part

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6

Fayette Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Side slopes
Parent material: Loess
Slope range: 2 to 40 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludalfs

Typical Pedon

Fayette silt loam, 10 to 15 percent slopes, eroded, 1,700 feet west and 2,100 feet north of the southeast corner of sec. 31, T. 12 N., R. 3 W.

Ap—0 to 5 inches; mixed dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; moderately acid; clear smooth boundary.

EB—5 to 9 inches; mixed brown (10YR 5/3) and yellowish brown (10YR 5/4) silt loam; weak medium platy structure parting to moderate fine subangular blocky; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; moderately acid; clear smooth boundary.

Bt1—9 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—13 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds;

moderately acid; gradual smooth boundary.

Bt3—27 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

BC—38 to 55 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and coarse subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films and common distinct light gray (10YR 7/2) silt grains on faces of peds; few prominent dark stains of iron and manganese oxides; strongly acid; clear wavy boundary.

C—55 to 60 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular blocky structure; friable; few prominent dark stains of iron and manganese oxides; moderately acid.

Range in Characteristics

A or Ap horizon:
Value—4 or 5
Chroma—2 or 3

Bt horizon:
Content of clay—31 percent in the upper part

BC horizon:
Texture—silt loam or silty clay loam

Harpster Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landscape: Uplands
Landform position: Broad flats and depressions
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mesic Typic Calciaquolls

Typical Pedon

Harpster silty clay loam, 600 feet east and 2,500 feet south of the northwest corner of sec. 8, T. 8 N., R. 3 W.

Apk—0 to 8 inches; black (5Y 2.5/1) silty clay loam, dark gray (5Y 4/1) dry; moderate medium granular structure; friable; few snail-shell fragments; violent effervescence; slightly alkaline; clear smooth boundary.

Ak—8 to 21 inches; black (5Y 2.5/1) silty clay loam, dark gray (5Y 4/1) dry; weak fine and medium subangular blocky structure; friable; few snail-shell fragments; violent effervescence; slightly alkaline; clear smooth boundary.

Bkg1—21 to 26 inches; gray (5Y 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; friable; many distinct black (5Y 2.5/1) organic coatings on faces of peds; common prominent dark stains and concretions of iron and manganese oxides; few snail-shell fragments and concretions of calcium carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.

Bkg2—26 to 35 inches; olive gray (5Y 5/2) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; friable; many prominent dark stains and concretions of iron and manganese oxides; common concretions of calcium carbonate; violent effervescence; slightly alkaline; clear wavy boundary.

Bkg3—35 to 44 inches; light olive gray (5Y 6/2) silt loam; few medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; many prominent dark stains and concretions of iron and manganese oxides; common concretions of calcium carbonate; violent effervescence; slightly alkaline; gradual wavy boundary.

BCg—44 to 60 inches; light olive gray (5Y 6/2) silt loam; few medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; many prominent dark stains and concretions of iron and manganese oxides; common concretions of calcium carbonate; violent effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 16 inches; calcium carbonate equivalent of 15 to 30 percent in one or more layers

Ak or Apk horizon:
Value—2 or 3
Chroma—0 or 1

Bkg horizon:
Value—3 to 6
Texture—silt loam or silty clay loam
Content of clay—27 to 35 percent in the upper part

Hickory Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Side slopes

Parent material: Glacial till or a thin mantle of loess and glacial till
Slope range: 10 to 50 percent
Taxonomic class: Fine-loamy, mixed, mesic Typic Hapludalfs

Typical Pedon

Hickory silt loam, 30 to 50 percent slopes, 300 feet north and 2,300 feet west of the southeast corner of sec. 24. T. 11 N., R. 2 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; neutral; clear smooth boundary.

E—4 to 9 inches; dark grayish brown (10YR 4/2) and brown (10YR 5/3) silt loam; weak thin and medium platy structure; friable; slightly acid; clear smooth boundary.

Bt1—9 to 20 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium subangular blocky structure; friable; many faint brown (10YR 4/3) clay films on faces of peds; few distinct dark grayish brown (10YR 4/2) organic coatings; about 5 percent gravel; moderately acid; clear smooth boundary.

Bt2—20 to 31 inches; yellowish brown (10YR 5/4) clay loam; few medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; many faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few prominent dark stains of iron and manganese oxides; about 10 percent gravel; strongly acid; gradual wavy boundary.

Bt3—31 to 40 inches; yellowish brown (10YR 5/4) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; many faint brown (10YR 5/3) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; about 10 percent gravel; moderately acid; gradual wavy boundary.

Bt4—40 to 50 inches; light olive brown (2.5Y 5/4) clay loam; few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common faint olive brown (2.5Y 4/4) clay films on faces of peds; many prominent dark stains of iron and manganese oxides; about 12 percent gravel; moderately acid; clear wavy boundary.

BC—50 to 55 inches; light olive brown (2.5Y 5/4) clay loam; many coarse prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few faint olive brown (2.5Y 4/4) clay films on vertical faces of peds; many prominent dark stains and concretions of iron and manganese oxides; about 15 percent gravel; slight effervescence; neutral; clear wavy boundary.

C—55 to 60 inches; yellowish brown (10YR 5/4) clay loam; common coarse prominent strong brown (7.5YR 5/6) mottles; massive; friable; many prominent dark stains and concretions of iron and manganese oxides; about 12 percent gravel; slight effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to 72 inches
Thickness of the loess: 0 to 20 inches

A horizon:
Value—3 to 5
Chroma—2 or 3

E horizon:
Value—4 or 5
Chroma—2 or 3

Bt horizon:
Hue—2.5Y, 10YR, or 7.5YR
Value—4 to 6
Chroma—4 to 6
Texture—clay loam or silty clay loam

Ipava Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landscape: Uplands
Landform position: Wide ridges and flats or ridgetops and side slopes
Parent material: Loess
Slope range: 0 to 4 percent
Taxonomic class: Fine, montmorillonitic, mesic Aquic Argiudolls

Typical Pedon

Ipava silt loam, 0 to 2 percent slopes, 250 feet west and 1,600 feet north of the southeast corner of sec. 20, T. 8 N., R. 1 W.

Ap—0 to 11 inches; very dark brown (10YR 2/2) silt loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A—11 to 18 inches; very dark brown (10YR 2/2) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; neutral; clear smooth boundary.

BA—18 to 24 inches; mixed brown (10YR 4/3) and dark grayish brown (10YR 4/2) silty clay loam; weak fine

and medium subangular blocky structure; friable; many distinct black (10YR 2/1) organic coatings on faces of peds; slightly acid; clear wavy boundary.

Bt—24 to 31 inches; brown (10YR 5/3) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and few medium distinct grayish brown (2.5Y 5/2) mottles; moderate medium and coarse angular blocky structure; friable; common distinct dark grayish brown (2.5Y 4/2) clay films and very dark gray (10YR 3/1) organic coatings on faces of peds; moderately acid; clear wavy boundary.

Btg—31 to 46 inches; light brownish gray (2.5Y 6/2) silty clay; common coarse prominent strong brown (7.5YR 5/6) mottles; weak medium and coarse prismatic structure parting to moderate medium and coarse angular blocky; friable; common faint grayish brown (2.5Y 5/2) clay films on faces of peds; few prominent dark stains of iron and manganese oxides; moderately acid; clear wavy boundary.

BCg—46 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; few prominent dark stains and concretions of iron and manganese oxides; slightly acid; clear wavy boundary.

Range in Characteristics

Depth to carbonates: 40 to 70 inches
Thickness of the mollic epipedon: 10 to 24 inches

Ap or A horizon:
Value—2 or 3
Chroma—1 or 2

Bt horizon:
Value—4 to 6
Chroma—2 to 4
Content of clay—35 to 38 percent in the upper part

BC horizon:
Value—5 or 6
Chroma—1 or 2

Joy Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Uplands
Landform position: Wide ridges and flats
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Aquic Hapludolls

Typical Pedon

Joy silt loam, 0 to 2 percent slopes, 2,000 feet east and 2,500 feet south of the northwest corner of sec. 17, T. 12 N., R. 3 W.

Ap—0 to 13 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; moderately acid; abrupt smooth boundary.

A—13 to 19 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) worm channels; moderately acid; clear smooth boundary.

Bt—19 to 28 inches; mixed brown (10YR 5/3) and grayish brown (10YR 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate very fine and fine subangular blocky structure; friable; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; common faint very dark grayish brown (10YR 3/2) wormcasts; slightly acid; clear smooth boundary.

Btg1—28 to 34 inches; grayish brown (2.5Y 5/2) silt loam; common medium prominent yellowish brown (10YR 5/6) and common medium distinct brown (10YR 5/3) mottles; moderate fine prismatic structure; friable; common faint grayish brown (2.5Y 5/2) clay films on faces of peds; common distinct very dark gray (10YR 3/1) wormcasts; slightly acid; clear smooth boundary.

Btg2—34 to 54 inches; grayish brown (2.5Y 5/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure; friable; few faint grayish brown (2.5Y 5/2) clay films on vertical faces of peds; common distinct dark gray (10YR 4/1) and very dark gray (10YR 3/1) krotovinas; common prominent dark stains of iron and manganese oxides; neutral; clear smooth boundary.

Cg—54 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; common prominent dark stains and concretions of iron and manganese oxides; slightly alkaline.

Range in Characteristics

Depth to carbonates: 40 to more than 60 inches
Thickness of the mollic epipedon: 10 to 24 inches

Ap or A horizon:
Value—2 or 3
Chroma—1 or 2

Bt horizon:
Value—4 to 6
Chroma—2 to 4

Content of clay—18 to 27 percent in the upper part

C horizon:
Value—5 or 6
Chroma—1 or 2

Keomah Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landscape: Uplands
Landform position: Broad ridgetops
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine, montmorillonitic, mesic Aeric Ochraqualfs

Typical Pedon

Keomah silt loam, 0 to 2 percent slopes, 130 feet north and 300 feet west of the southeast corner of sec. 24, T. 11 N., R. 2 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; moderately acid; abrupt smooth boundary.

E—7 to 11 inches; brown (10YR 4/3) silt loam; weak medium platy structure parting to weak fine subangular blocky; friable; common distinct very dark grayish brown (10YR 3/2) organic stains; few prominent dark stains and concretions of iron and manganese oxides; moderately acid; clear smooth boundary.

BE—11 to 15 inches; brown (10YR 5/3) silty clay loam; weak fine and medium subangular blocky structure; friable; few faint dark grayish brown (10YR 4/2) clay films, common faint dark grayish brown (10YR 4/2) organic coatings, and common prominent light gray (10YR 7/2) silt coatings on faces of peds; common prominent dark stains and concretions of iron and manganese oxides; very strongly acid; clear smooth boundary.

Bt1—15 to 20 inches; brown (10YR 5/3) silty clay loam; moderate medium subangular blocky structure; firm; many faint dark grayish brown (10YR 4/2) clay films on faces of peds; many prominent dark stains and concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

Bt2—20 to 28 inches; yellowish brown (10YR 5/4) silty clay; few medium prominent light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many distinct dark grayish brown (10YR 4/2) clay films and common distinct light brownish gray (10YR 6/2) silt grains on faces of peds; many prominent dark stains and concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

Btg—28 to 49 inches; mixed grayish brown (2.5Y 5/2) and olive (5Y 5/3) silty clay loam; many coarse prominent yellowish red (5YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct brown (10YR 4/3) clay films on faces of peds; many prominent dark stains and concretions of iron and manganese oxides; very strongly acid; clear wavy boundary.

BCg—49 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam; many coarse prominent yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; few faint dark grayish brown (2.5Y 4/2) clay films in pore spaces; common prominent dark stains and concretions of iron and manganese oxides; moderately acid; gradual wavy boundary.

Cg—55 to 60 inches; olive gray (5Y 5/2) silt loam; many medium prominent yellowish red (5YR 4/6) mottles; massive; friable; common prominent dark stains and concretions of iron and manganese oxides; slightly acid.

Range in Characteristics

Ap or A horizon:
Value—3 or 4
Chroma—1 or 2

E horizon:
Value—4 or 5
Chroma—1 to 3

Bt horizon:
Value—4 to 6
Content of clay—36 to 42 percent in the upper part

Lawson Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform position: Low areas (first bottom)
Parent material: Silty alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Cumulic Hapludolls

Typical Pedon

Lawson silt loam, frequently flooded, 2,400 feet west and 100 feet north of the southeast corner of sec. 27, T 12 N., R. 3 W.

Ap—0 to 7 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; slightly alkaline; clear smooth boundary.
A1—7 to 20 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; neutral; gradual smooth boundary.
A2—20 to 30 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; neutral; clear smooth boundary.
C1—30 to 43 inches; stratified very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), and dark grayish brown (10YR 4/2) silt loam; common medium prominent strong brown (7.5YR 4/6) mottles; massive; friable; neutral; gradual smooth boundary.
C2—43 to 60 inches; dark grayish brown (10YR 4/2) silt loam; few medium prominent strong brown (7.5YR 4/6) mottles; massive; friable; neutral.

Range in Characteristics

Ap or A horizon:
Chroma—1 or 2
Content of clay—18 to 30 percent in the control section

C horizon:
Hue—10YR or 2.5Y
Value—3 to 5
Chroma—1 to 3

Littleton Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Terraces
Landform position: Foot slopes
Parent material: Silty alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Cumulic Hapludolls

Typical Pedon

Littleton silt loam, 0 to 2 percent slopes, 1,460 feet east and 1,900 feet south of the northwest corner of sec. 27, T. 12 N., R. 3 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.
A—7 to 22 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; moderately acid; clear smooth boundary.
AB—22 to 30 inches; mixed black (10YR 2/1) and very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; friable; moderately acid; clear smooth boundary.
Bw1—30 to 38 inches; mixed brown (10YR 5/3) and grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; common faint dark grayish brown (10YR 4/2) clay films and very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common prominent dark stains of iron and manganese oxides; slightly acid; clear wavy boundary.
Bw2—38 to 45 inches; grayish brown (2.5Y 5/2) silt loam; many medium prominent yellowish brown (10YR 5/6) and few coarse faint light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; slightly acid; clear wavy boundary.
Bw3—45 to 55 inches; grayish brown (2.5Y 5/2) silt loam; common coarse prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; few faint grayish brown (2.5Y 5/2) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; neutral; clear wavy boundary.
Cg—55 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common coarse prominent yellowish brown (10YR 5/6) mottles; massive; friable; common prominent dark stains of iron and manganese oxides; neutral.

Range in Characteristics

Ap or A horizon:
Chroma—1 to 3

Bw horizon:
Value—3 to 5
Content of clay—18 to 27 percent in the upper part

Marseilles Series

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Moderate in the upper part; slow in the lower part
Landscape: Uplands

Landform position: Side slopes
Parent material: Loess and shale
Slope range: 10 to 60 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludalfs

Typical Pedon

Marseilles silt loam, 18 to 30 percent slopes, 240 feet east and 2,300 feet south of the northwest corner of sec. 17, T. 8 N., R. 2 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; common faint brown (10YR 5/3) wormcasts; moderately acid; clear smooth boundary.

E—4 to 9 inches; brown (10YR 4/3) silt loam; weak medium platy structure parting to weak very fine subangular blocky; friable; common faint brown (10YR 5/3) wormcasts; moderately acid; clear smooth boundary.

Bt1—9 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common distinct dark grayish brown (10YR 4/2) wormcasts; moderately acid; clear wavy boundary.

2Bt2—15 to 28 inches; mixed brown (10YR 5/3) and greenish gray (5GY 6/1) silty clay loam; moderate medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; about 15 percent soft fragments of shale; strongly acid; clear smooth boundary.

2Cr—28 to 60 inches; channery silty clay loam shale; massive; firm; about 20 percent soft fragments of shale; strongly acid.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches

A or Ap horizon:
Value—3 or 4
Chroma—2 or 3

E horizon:
Value—4 or 5
Chroma—2 or 3

2Bt horizon:
Hue—10YR, 2.5Y, or 5GY
Value—4 to 6

Mt. Carroll Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Narrow ridges
Parent material: Loess
Slope range: 2 to 5 percent
Taxonomic class: Fine-silty, mixed, mesic Mollic Hapludalfs

Typical Pedon

Mt. Carroll silt loam, 2 to 5 percent slopes, 1,100 feet west and 2,260 feet south of the northeast corner of sec. 19, T. 12 N., R. 3 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, mixed with brown (10YR 5/3) in the lower part; grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 16 inches; brown (10YR 5/3) silt loam; weak thick platy structure parting to weak very fine and fine subangular blocky; friable; common distinct very dark gray (10YR 3/1) wormcasts and organic coatings; common faint light gray (10YR 7/2) silt grains on faces of peds; slightly acid; clear smooth boundary.

Bt1—16 to 29 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; common prominent dark brown (7.5YR 3/2) organic coatings and common distinct light gray (10YR 7/2) silt grains on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; clear wavy boundary.

Bt2—29 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; friable; common faint brown (10YR 4/3) clay films, common prominent dark brown (7.5YR 3/2) organic coatings, and common distinct light gray (10YR 7/2) silt grains and coatings on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; clear wavy boundary.

Bt3—36 to 47 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and many medium prominent light brownish gray (2.5Y 6/2) mottles; weak medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films and common distinct light gray (10YR 7/2) silt grains and coatings on faces of peds; few prominent dark brown (7.5YR 3/2) organic coatings in root channels; common prominent dark stains of iron and manganese oxides; strongly acid; clear smooth boundary.

BC—47 to 56 inches; mixed light brownish gray (2.5Y

6/2) and yellowish brown (10YR 5/4) silt loam; common medium prominent strong brown (7.5YR 4/6) mottles; weak coarse subangular blocky structure; friable; few prominent dark brown (10YR 3/3) organic coatings and clay films and common distinct light gray (10YR 7/2) silt grains and coatings on vertical faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

C—56 to 60 inches; mixed light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/4) silt loam; common medium prominent strong brown (7.5YR 4/6) mottles; massive; friable; common prominent dark stains of iron and manganese oxides; moderately acid.

Range in Characteristics

Depth to carbonates: More than 60 inches
Depth to bedrock: More than 60 inches
Thickness of the loess: More than 60 inches

Ap horizon:
Value—2 or 3
Chroma—1 or 2

E horizon:
Value—4 to 6
Chroma—2 to 4

Bt horizon:
Chroma—2 to 4
Content of clay—18 to 27 percent

Muscatine Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Uplands
Landform position: Wide ridges and flats
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Aquic Hapludolls

Typical Pedon

Muscatine silt loam, 0 to 2 percent slopes, 100 feet east and 700 feet north of the southwest corner of sec. 2, T. 8 N., R. 3 W.

Ap—0 to 11 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; neutral; clear smooth boundary.

A—11 to 18 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to moderate medium granular; friable; slightly acid; clear smooth boundary.

BA—18 to 22 inches; mixed very dark grayish brown (10YR 3/2) and grayish brown (10YR 5/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bg1—22 to 28 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; moderately acid; clear wavy boundary.

Bg2—28 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bg3—40 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium and coarse prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds; slightly acid; clear wavy boundary.

BCg—48 to 56 inches; light brownish gray (2.5Y 6/2) silt loam; many coarse prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few distinct grayish brown (2.5Y 5/2) clay films on vertical faces of peds; neutral; clear wavy boundary.

Cg—56 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; many coarse prominent strong brown (7.5YR 5/6) mottles; massive; friable; neutral.

Range in Characteristics

Depth to carbonates: 48 to more than 60 inches
Thickness of the mollic epipedon: 10 to 24 inches

Ap or A horizon:
Value—2 or 3
Chroma—1 or 2

Bg horizon:
Value—4 to 6
Chroma—2 to 4
Content of clay—30 to 35 percent in the upper part

BC horizon:
Hue—2.5Y or 5Y
Value—5 or 6

C horizon:
Hue—2.5Y or 5Y
Value—5 or 6

Orion Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform position: Low areas (first bottom)
Parent material: Silty alluvium
Slope range: 0 to 2 percent
Taxonomic class: Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents

Typical Pedon

Orion silt loam, frequently flooded, 2,600 feet west and 160 feet south of the northeast corner of sec. 17, T. 8 N., R. 1 W.

Ap—0 to 9 inches; mixed dark grayish brown (10YR 4/2) and brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) and pale brown (10YR 6/3) dry; moderate fine granular structure; friable; moderately acid; abrupt smooth boundary.

C1—9 to 24 inches; stratified dark grayish brown (10YR 4/2) silt loam; few fine prominent strong brown (7.5YR 4/6) mottles; massive; common distinct light gray (10YR 7/2), stratified fine sands and silts; friable; moderately acid; clear smooth boundary.

C2—24 to 36 inches; dark grayish brown (10YR 4/2) silt loam; few fine faint brown (10YR 4/3) and common medium prominent strong brown (7.5YR 4/6) mottles; massive; common distinct light gray (10YR 7/2), stratified fine sands and silts; friable; few faint very dark gray (10YR 3/1) organic coatings on faces of peds; moderately acid; clear smooth boundary.

Ab1—36 to 45 inches; very dark gray (10YR 3/1) silty clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; friable; few distinct light brownish gray (10YR 6/2) silt coatings in root channels; moderately acid; clear smooth boundary.

Ab2—45 to 60 inches; very dark gray (10YR 3/1) silty clay loam; mixed with dark grayish brown (10YR 4/2) in the lower part; common fine prominent dark yellowish brown (10YR 4/6) mottles; weak very fine prismatic structure parting to weak medium subangular blocky; friable; common distinct light brownish gray (10YR 6/2) silt coatings; moderately acid.

Range in Characteristics

Ap or A horizon:
Value—4 or 5
Chroma—2 or 3

C horizon:
Value—4 or 5
Chroma—2 or 3

Ab horizon:
Hue—10YR or 2.5Y
Value—2 or 3
Chroma—1 or 2
Other features—thin lenses of very fine sand to coarse sand in some pedons

Port Byron Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Ridgetops and side slopes
Parent material: Loess
Slope range: 2 to 10 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludolls
Taxadjunct features: Port Byron silt loam, 5 to 10 percent slopes, eroded, has a thinner dark surface soil than is defined as the range for the series. This soil is classified as fine-silty, mixed, mesic Mollic Hapludalfs.

Typical Pedon

Port Byron silt loam, 2 to 5 percent slopes, 130 feet east and 1,900 feet south of the northwest corner of sec. 17, T. 12 N., R. 3 W.

Ap—0 to 11 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

BA—11 to 16 inches; mixed very dark brown (10YR 2/2) and dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw1—16 to 25 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; common faint very dark grayish brown (10YR 3/2) organic coatings; slightly acid; gradual smooth boundary.

Bw2—25 to 38 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common faint dark brown (10YR 4/3) clay films and common distinct light gray (10YR 7/1) silt coatings and grains on faces of peds; common prominent dark stains of iron and manganese oxides; slightly acid; gradual smooth boundary.

Bw3—38 to 50 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky

structure; friable; common faint dark brown (10YR 4/3) clay films and common distinct light gray (10YR 7/1) silt coatings and grains on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; gradual smooth boundary.

BC—50 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium prominent dark brown (7.5YR 4/2) mottles; weak medium subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films in pores and on vertical faces of peds; common distinct light gray (10YR 7/1) silt coatings and grains on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 24 inches

Ap or A horizon:
Value—2 or 3
Chroma—1 or 2

Bw horizon:
Value—4 or 5
Chroma—3 or 4
Content of clay—18 to 27 percent

BC horizon:
Value—5 or 6
Chroma—2 to 4

Raddle Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Terraces
Landform position: Foot slopes
Parent material: Silty alluvium
Slope range: 2 to 5 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludolls

Typical Pedon

Raddle silt loam, 2 to 5 percent slopes, 2,000 feet east and 1,500 feet north of the southwest corner of sec. 26, T. 12 N., R. 3 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A—8 to 12 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

AB—12 to 17 inches; mixed very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; moderately acid; clear smooth boundary.

Bw1—17 to 23 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; common faint dark brown (10YR 3/3) clay films on faces of peds; many faint very dark brown (10YR 2/2) organic coatings in root channels; moderately acid; clear smooth boundary.

Bw2—23 to 34 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on faces of peds; moderately acid; clear smooth boundary.

Bw3—34 to 44 inches; yellowish brown (10YR 5/4) silt loam; few medium faint brown (10YR 5/3) and few medium prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common faint yellowish brown (10YR 5/4) clay films on faces of peds; few prominent dark stains of iron and manganese oxides; slightly acid; clear smooth boundary.

BC—44 to 50 inches; yellowish brown (10YR 5/4) silt loam; many fine prominent light yellowish brown (2.5Y 6/3) and common fine and medium prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few sand grains; many prominent dark stains of iron and manganese oxides; neutral; gradual smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/4) silt loam; many medium prominent light yellowish brown (2.5Y 6/3) and strong brown (7.5YR 5/6) mottles; massive; friable; few sand grains; many prominent stains of iron and manganese oxides; neutral.

Range in Characteristics

Ap or A horizon:
Value—2 or 3

Bw horizon:
Content of clay—18 to 24 percent in the upper part

C horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—2 to 4

Radford Series

Depth class: Very deep

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform position: Low areas (first bottom)
Parent material: Silty alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Fluvaquentic Hapludolls

Typical Pedon

Radford silt loam, frequently flooded, 740 feet west and 460 feet south of the northeast corner of sec. 28, T. 12 N., R. 3 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A—7 to 12 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak thin platy structure parting to moderate fine granular; friable; slightly acid; clear smooth boundary.

C1—12 to 19 inches; mixed very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) silt loam with thin strata of grayish brown (2.5Y 5/2) silt loam; common medium prominent dark brown (7.5YR 3/4) mottles; massive; friable; neutral; clear smooth boundary.

C2—19 to 32 inches; very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) silt loam with thin strata of brown (10YR 5/3) silt loam; few medium prominent brown (7.5YR 4/4) mottles; massive; friable; slightly acid; clear smooth boundary.

Ab1—32 to 46 inches; black (10YR 2/1) silty clay loam, mixed with very dark brown (10YR 3/2) in the lower part; moderate fine subangular blocky structure parting to moderate fine granular; friable; neutral; gradual smooth boundary.

Ab2—46 to 60 inches; mixed very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) silty clay loam; few fine prominent dark brown (7.5YR 3/4) mottles; moderate fine subangular blocky structure; friable; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches

Ap or A horizon:
Value—2 or 3
Chroma—1 or 2

C horizon:
Value—2 to 6

Ab horizon:
Hue—10YR or neutral
Chroma—0 to 2

Rozetta Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Ridgetops and side slopes
Parent material: Loess
Slope range: 2 to 10 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludalfs

Typical Pedon

Rozetta silt loam, 2 to 5 percent slopes, 285 feet west and 715 feet north of the southeast corner of sec. 9, T. 8 N., R. 2 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

E—9 to 13 inches; brown (10YR 5/3) silt loam; weak thin platy structure; friable; slightly acid; clear smooth boundary.

Bt1—13 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; many faint brown (10YR 5/3) clay films on faces of peds; few prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

Bt2—26 to 37 inches; yellowish brown (10YR 5/4) silty clay loam; many medium and coarse distinct light yellowish brown (2.5Y 6/4) mottles; few medium prominent light brownish gray (2.5Y 6/2) mottles in the lower part; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; many faint brown (10YR 5/3) clay films and many distinct light gray (10YR 7/2) silt grains on faces of peds; many prominent dark stains of iron and manganese oxides; strongly acid; gradual wavy boundary.

Bt3—37 to 50 inches; yellowish brown (10YR 5/4) silty clay loam; many coarse prominent light brownish gray (2.5Y 6/2) and many coarse distinct light yellowish brown (2.5Y 6/4) mottles; moderate medium subangular blocky structure; friable; common faint brown (10YR 5/3) clay films and common distinct light gray (10YR 7/2) silt grains on faces of peds; many prominent dark stains of iron and manganese oxides; strongly acid; gradual wavy boundary.

BC—50 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; common coarse distinct light olive brown (2.5Y 5/4) and common coarse prominent grayish brown (2.5Y 5/2) mottles; weak medium subangular

blocky structure; friable; few faint brown (10YR 5/3) clay films on vertical faces of peds; common prominent dark stains of iron and manganese oxides; strongly acid.

Range in Characteristics

Ap horizon:
Value—3 to 5
Chroma—2 or 3

E horizon:
Value—4 to 6
Chroma—2 or 3

Bt horizon:
Value—4 or 5
Chroma—3 to 6
Content of clay—27 to 35 percent in the upper part

Sable Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landscape: Uplands
Landform position: Broad flats and depressions
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Haplaquolls

Typical Pedon

Sable silty clay loam, 97 feet west and 1,281 feet south of the northeast corner of sec. 14, T. 9 N., R. 3 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; firm; moderately acid; abrupt smooth boundary.

A—8 to 19 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine angular blocky structure; firm; few faint dark concretions of iron and manganese oxides; slightly acid; clear smooth boundary.

AB—19 to 23 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine angular blocky structure; firm; few faint dark concretions of iron and manganese oxides; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bg—23 to 29 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct brown (10YR 5/3) and few medium faint dark grayish brown (10YR 4/2) mottles; moderate fine and medium subangular blocky structure; firm; common faint very dark gray (10YR 3/1) organic coatings on faces of peds; common prominent dark concretions of iron and manganese oxides; neutral; clear smooth boundary.

Btg1—29 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; many prominent dark concretions of iron and manganese oxides; neutral; clear wavy boundary.

Btg2—38 to 47 inches; gray (N 5/0) silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium and coarse angular blocky; firm; few prominent grayish brown (10YR 5/2) clay films on vertical faces of peds; common prominent dark concretions of iron and manganese oxides; slightly alkaline; gradual smooth boundary.

Cg—47 to 60 inches; gray (N 6/0) silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; slight effervescence; slightly alkaline.

Range in Characteristics

Ap or A horizon:
Value—2 or 3
Chroma—0 or 1

Bg or Bt horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 2
Texture—silty clay loam or silt loam
Content of clay—27 to 35 percent in the upper part

C horizon:
Hue—2.5Y, 5Y, or neutral
Value—4 to 6
Chroma—0 to 2

Sawmill Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landscape: Flood plains
Landform position: Low areas (first bottom)
Parent material: Silty alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Cumulic Haplaquolls

Typical Pedon

Sawmill silty clay loam, frequently flooded, 200 feet south and 1,140 feet west of the northeast corner of

sec. 1, T. 12 N., R. 3 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate medium granular structure; firm; neutral; clear smooth boundary.

A1—9 to 17 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few medium prominent strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure parting to moderate medium granular; firm; neutral; clear wavy boundary.

A2—17 to 30 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/2) dry; few fine prominent strong brown (7.5YR 5/8) mottles; weak fine and medium subangular blocky structure; firm; neutral; clear wavy boundary.

Bg1—30 to 38 inches; dark gray (5Y 4/1) silty clay loam; common fine prominent brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; many faint dark olive gray (5Y 3/2) clay films on faces of peds; about 2 percent sand; neutral; clear wavy boundary.

Bg2—38 to 45 inches; mixed grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; about 5 percent sand; neutral; gradual wavy boundary.

Cg—45 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; massive; firm; about 10 percent sand; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 36 inches

Ap or A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2

Bg horizon:
Hue—10YR, 2.5Y, or neutral
Value—4 to 6
Chroma—0 to 2

Seaton Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Ridgetops and side slopes
Parent material: Loess
Slope range: 5 to 15 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludalfs

Typical Pedon

Seaton silt loam, 10 to 15 percent slopes, 1,080 feet west and 2,600 feet north of the southeast corner of sec. 19, T. 12 N., R. 3 W.

Ap—0 to 8 inches; mixed dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 11 inches; mixed brown (10YR 5/3) and yellowish brown (10YR 5/4) silt loam; weak thin and medium platy structure; friable; slightly acid; clear smooth boundary.

Bt1—11 to 20 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt2—20 to 30 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; friable; common faint yellowish brown (10YR 5/4) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

Bt3—30 to 55 inches; yellowish brown (10YR 5/4) silt loam; few medium and coarse faint pale brown (10YR 6/3) mottles; moderate fine and medium subangular blocky structure; friable; common faint brown (10YR 5/3) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

BC—55 to 60 inches; mixed yellowish brown (10YR 5/4 and light yellowish brown (2.5Y 6/4) silt loam; few medium and coarse faint pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; many prominent dark stains of iron and manganese oxides; neutral.

Range in Characteristics

A or Ap horizon:
Value—3 or 4
Chroma—2 or 3

E horizon:
Value—4 or 5
Chroma—2 to 4

Bt horizon:
Value—4 or 5
Chroma—3 or 4
Content of clay—28 to 27 percent

Stronghurst Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landscape: Uplands
Landform position: Wide ridges and flats
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic class: Fine-silty, mixed, mesic Aeric Ochraqualfs

Typical Pedon

Stronghurst silt loam, 0 to 2 percent slopes, 100 feet north and 1,700 feet east of the southwest corner of sec. 18, T. 9 N., R. 3 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

E—7 to 13 inches; brown (10YR 5/3) silt loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak thin and medium platy structure; friable; few prominent dark stains of iron and manganese oxides; neutral; abrupt smooth boundary.

BE—13 to 17 inches; mixed brown (10YR 5/3) and grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; common prominent dark stains of iron and manganese oxides; moderately acid; clear smooth boundary.

Btg1—17 to 28 inches; mixed brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam; few medium distinct light brownish gray (2.5Y 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium angular blocky structure; friable; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; strongly acid; clear wavy boundary.

Btg2—28 to 41 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine and medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common faint grayish brown (2.5Y 5/2) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; common distinct very dark grayish brown (2.5Y 3/2) krotovinas; slightly acid; gradual wavy boundary.

BCg—41 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine and medium prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common prominent dark stains of iron and manganese oxides; neutral; gradual wavy boundary.

Cg—48 to 60 inches; light olive gray (5Y 6/2) silt loam; many medium prominent brownish yellow (10YR 6/6) mottles; massive; friable; common prominent dark stains of iron and manganese oxides; neutral.

Range in Characteristics

Ap horizon:
Value—4 to 6
Chroma—1 or 2

E horizon:
Value—4 to 6
Chroma—2 or 3

Bt horizon:
Value—4 to 6
Chroma—1 to 4
Content of clay—27 to 35 percent

Sylvan Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Side slopes
Parent material: Loess
Slope range: 10 to 18 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludalfs

Typical Pedon

Sylvan silt loam, 10 to 18 percent slopes, eroded, 60 feet east and 1,660 feet south of the northwest corner of sec. 25, T. 15 N., R. 2 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate fine and medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

Bt1—5 to 9 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—9 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; gradual wavy boundary.

Bt3—19 to 30 inches; yellowish brown (10YR 5/4) silt

loam; common medium distinct pale brown (10YR 6/3) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.

C—30 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; few medium prominent yellowish red (5YR 4/6) and common medium and coarse prominent yellowish brown (10YR 5/6) mottles; massive; friable; numerous concretions of lime; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 20 to 40 inches

A or Ap horizon:
Value—4 or 5
Chroma—2 or 3

Bt horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 to 6
Content of clay—27 to 35 percent in the upper part

C horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 6

Tama Series

Depth class: Very deep
Drainage class: Well drained and moderately well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Ridgetops and side slopes
Parent material: Loess
Slope range: 2 to 15 percent
Taxonomic class: Fine-silty, mixed, mesic Typic Argiudolls
Taxadjunct features: Tama silt loam, 2 to 5 percent slopes, eroded, Tama silt loam, 5 to 10 percent slopes, eroded, Tama silty clay loam, 5 to 10 percent slopes, severely eroded, and Tama silt loam, 10 to 15 percent slopes, eroded, have a thinner dark surface soil than is defined as the range for the series. These soils are classified as fine-silty, mixed, mesic Mollic Hapludalfs.

Typical Pedon

Tama silt loam, 2 to 5 percent slopes, 100 feet south and 1,900 feet west of the northeast corner of sec. 35, T. 9 N., R. 3 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 16 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; neutral; clear smooth boundary.

BA—16 to 22 inches; brown (10YR 4/3) silty clay loam; weak fine and medium subangular blocky structure; friable; common faint dark brown (10YR 3/3) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—22 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct dark gray (10YR 4/1) wormcasts; moderately acid; clear wavy boundary.

Bt2—32 to 44 inches; yellowish brown (10YR 5/4) silty clay loam; few coarse prominent light brownish gray (2.5Y 6/2) and common medium distinct brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common faint brown (10YR 4/3) clay films on faces of peds; few prominent dark stains of iron and manganese oxides; moderately acid; gradual wavy boundary.

BC—44 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; many medium prominent light brownish gray (2.5Y 6/2) and many fine and medium distinct brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; many prominent dark stains of iron and manganese oxides; slightly acid.

Range in Characteristics

Depth to carbonates: 48 to more than 60 inches
Thickness of the mollic epipedon: 10 to 24 inches

Ap or A horizon:
Value—2 or 3
Chroma—1 to 3
Texture—silt loam or silty clay loam

Bt horizon:
Value—4 or 5
Texture—silty clay loam or silt loam
Content of clay—27 to 35 percent in the upper part

Timula Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Side slopes

Parent material: Loess
Slope range: 10 to 18 percent
Taxonomic class: Coarse-silty, mixed, mesic Typic Eutrochrepts

Typical Pedon

Timula silt loam, in an area of Seaton-Timula complex, 10 to 18 percent slopes, severely eroded, 2,500 feet south and 300 feet west of the northeast corner of sec. 29, T. 12 N., R. 3 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

Bw1—5 to 16 inches; light yellowish brown (10YR 6/4) silt loam; weak medium subangular blocky structure; friable; few faint brown (10YR 4/3) organic coatings and pale brown (10YR 6/3) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—16 to 23 inches; yellowish brown (10YR 5/4) silt; weak medium and coarse subangular blocky structure; friable; few prominent dark stains of iron and manganese oxides; neutral; clear wavy boundary.

C—23 to 60 inches; mixed yellowish brown (10YR 5/4) and pale yellow (2.5Y 7/4) silt; massive; friable; many prominent dark stains of iron and manganese oxides; few concretions of calcium carbonate; violent effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 18 to 36 inches

A or Ap horizon:
Value—3 or 4
Chroma—2 or 3

Bw horizon:
Value—4 to 6
Chroma—4 to 6
Content of clay—less than 18 percent
Content of sand—less than 15 percent coarser than very fine sand

Velma Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Side slopes
Parent material: Glacial till
Slope range: 10 to 18 percent
Taxonomic class: Fine-loamy, mixed, mesic Typic Argiudolls
Taxadjunct features: The Velma soils in this survey area have a thinner dark surface soil than is defined as the range for the series. They are classified as fine-loamy, mixed, mesic Mollic Hapludalfs.

Typical Pedon

Velma silt loam, 10 to 18 percent slopes, eroded, 560 feet east and 560 feet north of the southwest corner of sec. 30, T. 9 N., R. 1 W.

Ap—0 to 7 inches; mixed very dark gray (10YR 3/1) and brown (10YR 4/3) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; about 2 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—7 to 19 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine and medium subangular blocky structure; friable; common faint dark brown (10YR 4/3) clay films on faces of peds; about 2 percent gravel; moderately acid; clear smooth boundary.

Bt2—19 to 32 inches; yellowish brown (10YR 5/4) clay loam; moderate coarse subangular blocky structure; friable; common faint brown (10YR 5/3) clay films on faces of peds; few prominent dark stains of iron and manganese oxides; about 5 percent gravel; moderately acid; clear wavy boundary.

Bt3—32 to 45 inches; brown (10YR 5/3) clay loam; few coarse prominent olive (5Y 6/3) mottles; moderate coarse subangular blocky structure; friable; common faint dark brown (10YR 4/3) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; about 5 percent gravel; slightly acid; clear wavy boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) clay loam; few coarse prominent light olive gray (5Y 6/2) mottles; massive; friable; common prominent dark stains of iron and manganese oxides; about 10 percent gravel; slight effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 42 to 60 inches
Thickness of the mollic epipedon: 6 to 9 inches

Ap horizon:
Value—2 or 3
Chroma—1 to 3

Bt horizon:
Hue—10YR or 7.5YR
Chroma—3 to 6

Westville Series

Depth class: Very deep

Drainage class: Well drained
Permeability: Moderate
Landscape: Uplands
Landform position: Side slopes
Parent material: Glacial till
Slope range: 12 to 20 percent
Taxonomic class: Fine-loamy, mixed, mesic Typic Hapludalfs

Typical Pedon

Westville loam, in an area of Fayette-Westville complex, 12 to 20 percent slopes, 320 feet east and 1,000 feet north of the southwest corner of sec. 35, T. 12 N., R. 3 W.

Ap—0 to 5 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; about 2 percent gravel; slightly acid; clear wavy boundary.

Bt1—5 to 9 inches; dark brown (7.5YR 4/4) clay loam; weak fine and medium subangular blocky structure; friable; common distinct reddish brown (5YR 4/4) clay films on faces of peds; common prominent dark grayish brown (10YR 4/2) organic coatings on faces of peds; about 2 percent gravel; moderately acid; clear wavy boundary.

Bt2—9 to 20 inches; dark brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; friable; common distinct reddish brown (5YR 4/4) clay films on faces of peds; few prominent dark stains of iron and manganese oxides; about 5 percent gravel; moderately acid; gradual wavy boundary.

Bt3—20 to 28 inches; reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; friable; common distinct dark reddish brown (2.5YR 3/4) clay films on faces of peds; common prominent dark stains of iron and manganese oxides; about 5 percent gravel; slightly acid; gradual wavy boundary.

Bt4—28 to 41 inches; reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; friable; common faint reddish brown (5YR 4/4) clay films on faces of peds; common prominent light gray (10YR 7/2) silt coatings on faces of peds; common prominent dark stains of iron and manganese oxides; about 5 percent gravel; slightly acid; clear wavy boundary.

Bt5—41 to 48 inches; reddish brown (5YR 5/4) clay loam; moderate medium subangular blocky structure; friable; common faint reddish brown (5YR 4/3) clay films on faces of peds; common prominent light gray (10YR 7/2) silt coatings on faces of peds; common prominent dark stains of iron and manganese oxides; about 6 percent gravel; slightly acid; gradual wavy boundary.

BC—48 to 54 inches; mixed dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) clay loam; weak medium subangular blocky structure; friable; common prominent light gray (10YR 7/2) silt coatings on faces of peds; common prominent dark stains of iron and manganese oxides; about 6 percent gravel; slightly acid; gradual wavy boundary.

C—54 to 60 inches; mixed dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) loam; massive; friable; about 6 percent gravel; neutral.

Range in Characteristics

Thickness of the loess: 0 to 15 inches

Ap or A horizon:
Value—3 or 4
Chroma—2 or 3

Bt horizon:
Value—4 to 6
Chroma—3 or 4

C horizon:
Value—4 to 6

Zook Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landscape: Flood plains
Landform position: Low areas (first bottom)
Parent material: Clayey alluvium
Slope range: 0 to 2 percent
Taxonomic class: Fine, montmorillonitic, mesic Cumulic Haplaquolls

Typical Pedon

Zook silty clay loam, frequently flooded, 2,640 feet west and 1,200 feet south of the northeast corner of sec. 22, T. 12 N., R. 3 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; slightly acid; clear smooth boundary.

A—8 to 22 inches; very dark gray (N 3/0) silty clay, gray (N 5/0) dry; moderate fine subangular blocky structure; firm; slightly acid; clear smooth boundary.

Bg1—22 to 38 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; few fine prominent strong brown (7.5YR 5/6) mottles; weak fine prismatic structure parting to moderate fine subangular and angular blocky; firm; neutral; clear wavy boundary.

Bg2—38 to 55 inches; dark gray (5Y 4/1) silty clay; common medium faint olive gray (5Y 5/2) and

common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular and angular blocky; firm; common faint very dark gray (5Y 3/1) organic coatings in root channels and krotovinas; neutral; clear wavy boundary.

BCg—55 to 60 inches; olive gray (5Y 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; firm; common faint gray (5Y 5/1) organic coatings in root channels and on faces of peds; neutral.

Range in Characteristics

Ap or A horizon:

Hue—10YR, 2.5Y, or neutral
Chroma—0 to 2

Bg horizon:

Hue—10YR, 2.5Y, 5Y, or neutral
Value—2 to 6
Chroma—0 or 1
Texture—silty clay or silty clay loam
Content of clay—32 to 45 percent

Formation of the Soils

Soil forms through processes that act on deposited or accumulated geologic material. The soil characteristics at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material accumulated and has existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the parent material (Jenny, 1941).

Climate and plant and animal life are the active factors of soil formation. They act directly on the parent material either in place or after it has been relocated by water, glaciers, or the wind and slowly change it into a natural body that has genetically related horizons. Relief can modify the effects of climate and plant and animal life by inhibiting soil formation on eroded slopes and in wet depressions in nearly level areas. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of parent material into a soil that has differentiated horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless the effects of the other factors are understood.

Parent Material

Parent material is the unconsolidated geologic material in which soils form. It affects the chemical and mineralogical composition of the soil and, to a large extent, the rate at which soil-forming processes take place. The soils in Warren County formed in a variety of parent materials. These include loess, alluvium, glacial till, material weathered from bedrock, and glacial outwash.

Loess, which is silty material deposited by the wind, is the most extensive parent material in Warren County. The major source of this loess is the Mississippi River Valley, and some smaller streams also may have been sources. These sediments were exposed to the wind when rivers swollen with glacial meltwater from the Wisconsinan glaciers dried seasonally and as the glaciers retreated. As the sediments in the river valleys were exposed, the predominantly northwesterly winds picked up the loess and transported it many miles.

The loess covered the Illinoian till in a relatively uniform layer. In Warren County, thickness of the loess ranges from 12 feet in the northwest to 9 feet in the southeastern part of the county. Loess is the parent material in about 80 percent of the survey area. Most of the upland soils in the county formed in loess. Examples are Muscatine, Sable, Rozetta, and Tama soils.

Alluvial sediments were deposited mainly during periods of stream overflow. They make up about 7 percent of the survey area. The alluvial deposits are throughout the county, but the major deposits are along Cedar and Henderson Creeks. The width of the areas ranges from less than one-eighth mile along minor streams and the smaller drainageways to nearly 1 mile along major streams. The sediments generally are silty or clayey. In many areas the soils have a buried horizon of darker soil material. A few places have deposits of sand on the surface. Zook, Sawmill, Radford, and Orion are examples of alluvial soils.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of particles of different sizes mixed together. The small pebbles in glacial till generally have distinct edges and corners, which indicates that they have not been subject to intense washing by water. The glacial till in Warren County was deposited during the Illinoian Stage (Piskin and Bergstrom, 1975). It is generally loam or clay loam. Soils that formed in this material, such as Hickory and Velma soils, generally are on strongly sloping to very steep side slopes. They make up about 5 percent of the survey area.

In some areas a very firm layer that has a high content of clay is in the upper few feet of the Illinoian till. This layer is a paleosol, which formed during the Sangamonian stage, between the Illinoian and

Wisconsinan stages (Piskin and Bergstrom, 1975). During the Sangamonian stage, the glacial till was the surface deposit. It was subject to soil-forming processes. During the Wisconsinan stage, these soils were buried by loess deposits. Assumption and Elco are examples of soils that formed in paleosol till under a thin layer of loess.

Pennsylvanian-age and Mississippian-age bedrock underlie most of the unconsolidated deposits throughout the county (Willman and others, 1975). The parent material that weathered from this shale and limestone bedrock dominates the strongly sloping to very steep areas adjacent to many streams and drainageways in the eastern and northwestern parts of the county. Marseilles and Dunbarton soils formed in these materials.

Outwash deposits are not extensive in Warren County, but they occur in small, isolated pockets on dissected upland hillsides near major streams. They consist mainly of layers of sandy and loamy strata covered by loess or glacial till. In a few areas the outwash is exposed at the surface. Because of their small size, these outwash areas have been identified on the soil maps with an ad hoc (#) spot symbol. The most extensive outwash deposits are in Berwick, Greenbush, and Sumner Townships on the hillsides along Picayune, Swan, and Henderson Creeks and their tributaries.

Plant and Animal Life

Soils are greatly affected by the type of vegetation under which they formed. The chief contribution of the vegetation and biological processes to soil formation is the addition of organic matter and nitrogen to the soil. The kind of organic material in the soil depends primarily on the kinds of native plants that grew on the soil. The remains of these plants accumulated on the surface, decayed, and eventually became soil organic matter or humus. The roots of the plants added organic matter as they decayed. They also provided channels for the downward movement of water through the soil.

The native vegetation in Warren County was mainly tall prairie grasses and deciduous hardwood trees. The tall prairie grasses covered about 70 percent of the survey area. Their many fine, fibrous roots added large amounts of organic matter to the soil as they decayed. Soils that formed under prairie vegetation, therefore, have a thick, black or dark brown surface layer. The prairie soils in the county are generally on broad upland flats between streams. Muscatine, Sable, Ipava, and Tama soils formed under prairie vegetation.

Much of the land lying along watercourses in Warren County was originally covered with timber. This land makes up about 30 percent of the county. The deciduous hardwood trees in these areas contributed organic matter to the soil mainly as leaf litter. Their root systems were less fibrous than those of grasses and generally were not concentrated near the surface. Therefore, soils that formed under hardwood trees have a surface soil that is thinner and lighter colored than that of soils that formed under prairie grasses. Rozetta, Hickory, Fayette, and Marseilles soils formed under woodland vegetation.

Although plants are the major living organisms affecting soil formation, micro-organisms, earthworms, insects, and large burrowing animals that live in or on the soil also influence soil formation. Bacteria and fungi help to break down and decompose dead plants and animals and transform them into humus. Burrowing animals, such as earthworms, cicadas, and ground squirrels, help to incorporate the humus into the soil. Humus is very important in the development of soil structure and good tilth.

Climate

Warren County has a temperate, humid, midcontinental climate. The climate is essentially uniform throughout the county. Climatic differences are too small to have caused any obvious differences among the soils, except perhaps where the effects of climate are modified locally by relief.

Climate influences soil formation through its effects on weathering, plant and animal life, and erosion. Water from rain and melting snow seeps slowly downward through the soil and causes physical and chemical changes. As the water moves downward, clay is moved from the surface soil to the subsoil, where it accumulates. The water dissolves minerals and moves them downward through the soil. This leaching process has removed free lime from the upper layers of most of the soils in Warren County. Soil temperature is also an important element of the climate that affects soil formation. Many of the processes of soil formation are halted or slowed during periods when the soil is frozen.

Climate also influences the kind and extent of plant and animal life. The climate in Warren County has favored tall prairie grasses and deciduous hardwood forests. It also favors the decomposition of plants and animals, which are then incorporated into the soil.

Heavy rains are harmful if the soils are exposed as a result of farming. Early spring rains can also cause extensive erosion during periods when the soil is partially frozen. The freezing restricts the rate of water infiltration and thus increases the runoff rate.

Relief

Some differences in the soil are the result of relief, or local changes in elevation. Drainage, runoff, and the degree of erosion or deposition are all affected by the relief of an area. As the slope increases, the rate of runoff and the hazard of erosion increase and the rate of soil development decreases. The water table generally is at a greater depth in sloping areas than in nearly level or depressional areas, and thus the soils that form in both areas will have different characteristics even though they may have formed in similar parent material.

Time

The evaluation of time as a factor in soil formation is difficult because of the combined effects of the other soil-forming factors. Generally, the longer the soil is subject to a soil-forming factor, the more strongly developed it is. However, an apparently young, slightly weathered soil and an apparently old, strongly weathered soil may form in the same period of time if other factors of soil formation are quite different. Soils also form more rapidly in materials that contain low amounts of carbonates than in materials that contain greater amounts.

References

American Association of State Highway and Transportation Officials (AASHTO). 1986. Standard specifications for highway materials and methods of sampling and testing. 14th edition, 2 vols.

American Society for Testing and Materials (ASTM). 1993. Standard classification of soils for engineering purposes. ASTM Standard D 2487.

Brueckman, J.E., and R.E. Bergstrom. 1968. Ground-water geology of the Rock Island, Monmouth, Galesburg and Kewanee area, Illinois. Illinois State Geological Survey, Report of Investigations 221.

Fehrenbacher, J.B., and others. 1978. Soil productivity in Illinois. University of Illinois, College of Agriculture, Cooperative Extension Service, Circular 1156.

Jenny, Hans. 1941. Factors of soil formation.

Piskin, Kemal, and R.E. Bergstrom. 1975. Glacial drift in Illinois: Thickness and character. Illinois Geological Survey Circular 490.

Reineback, L.M. 1970. Soils of Warren County, Illinois. U.S. Department of Agriculture, Soil Conservation Service.

United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conservation Service, U.S. Department of Agriculture Handbook 436.

United States Department of Agriculture. 1993. Soil survey manual. U.S. Department of Agriculture Handbook 18.

United States Department of Commerce, Bureau of the Census. 1983. 1982 census of agriculture, preliminary report—Warren County, Illinois.

Wascher, H.L., and R.S. Smith. 1941. Warren County soils. University of Illinois, Agricultural Experimental Station Soil Report 70.

Willman, H.B., and others. 1975. Handbook of Illinois Stratigraphy. Illinois State Geological Survey Bulletin 95.

Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some

other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles 2 millimeters to 38 centimeters (15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Congeliturbate. Soil material disturbed by frost action.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of

artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at

saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material.

Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water

through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 drawbar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand;

shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single*

grained (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961-90 at Monmouth, Illinois)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	31.2	13.6	22.4	59	-17	0	1.54	0.63	2.30	4	7.4
February----	36.5	18.3	27.4	64	-11	1	1.37	.76	1.91	4	6.4
March-------	49.2	29.3	39.2	80	4	35	2.96	1.67	4.11	6	4.3
April-------	63.8	40.4	52.1	87	20	153	3.68	1.95	5.19	6	1.2
May---------	74.5	50.4	62.5	91	32	393	3.84	2.44	5.11	7	.0
June--------	83.2	59.6	71.4	96	42	642	3.96	2.26	5.47	6	.0
July--------	86.8	63.7	75.2	99	48	783	4.37	2.18	6.28	6	.0
August------	84.4	61.0	72.7	98	45	705	3.76	2.06	5.26	5	.0
September---	77.4	53.6	65.5	94	33	467	3.99	1.54	6.04	6	.0
October-----	65.6	42.9	54.3	86	22	194	3.01	1.14	4.56	6	.2
November----	50.2	31.7	40.9	74	8	34	2.36	1.16	3.41	5	2.0
December----	35.4	19.4	27.4	64	-11	3	2.27	1.24	3.17	4	6.7
Yearly:											
Average---	61.5	40.3	50.9	---	---	---	---	---	---	---	---
Extreme---	---	---	---	99	-18	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,409	37.11	30.64	43.28	65	28.2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961-90 at Monmouth, Illinois)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 15	Apr. 25	May 4
2 years in 10 later than--	Apr. 10	Apr. 20	Apr. 30
5 years in 10 later than--	Mar. 31	Apr. 10	Apr. 22
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 23	Oct. 9	Sept. 24
2 years in 10 earlier than--	Oct. 27	Oct. 15	Sept. 30
5 years in 10 earlier than--	Nov. 5	Oct. 25	Oct. 11

TABLE 3.--GROWING SEASON

(Recorded in the period 1961-90 at Monmouth, Illinois)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	199	176	150
8 years in 10	206	183	158
5 years in 10	218	197	172
2 years in 10	230	211	185
1 year in 10	236	218	193

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
7D3	Atlas silty clay loam, 10 to 18 percent slopes, severely eroded	20	*
8D2	Hickory silt loam, 10 to 18 percent slopes, eroded	5,565	1.6
8D3	Hickory clay loam, 10 to 18 percent slopes, severely eroded	530	0.2
8F	Hickory silt loam, 18 to 30 percent slopes	7,320	2.1
8G	Hickory silt loam, 30 to 50 percent slopes	3,265	0.9
17A	Keomah silt loam, 0 to 2 percent slopes	2,100	0.6
19D2	Sylvan silt loam, 10 to 18 percent slopes, eroded	5	*
19D3	Sylvan silty clay loam, 10 to 18 percent slopes, severely eroded	5	*
36B	Tama silt loam, 2 to 5 percent slopes	58,450	16.8
36B2	Tama silt loam, 2 to 5 percent slopes, eroded	11,200	3.2
36C2	Tama silt loam, 5 to 10 percent slopes, eroded	22,975	6.6
36C3	Tama silty clay loam, 5 to 10 percent slopes, severely eroded	1,280	0.4
36D2	Tama silt loam, 10 to 15 percent slopes, eroded	1,165	0.3
41A	Muscatine silt loam, 0 to 2 percent slopes	69,710	20.0
43A	Ipava silt loam, 0 to 2 percent slopes	8,690	2.5
43B	Ipava silt loam, 2 to 4 percent slopes	5,730	1.6
45	Denny silt loam	350	0.1
61A	Atterberry silt loam, 0 to 2 percent slopes	565	0.2
67	Harpster silty clay loam	430	0.1
68	Sable silty clay loam	41,090	11.8
68+	Sable silt loam, overwash	345	0.1
81A	Littleton silt loam, 0 to 2 percent slopes	620	0.2
119D2	Elco silt loam, 10 to 15 percent slopes, eroded	4,175	1.2
119E2	Elco silt loam, 15 to 20 percent slopes, eroded	2,640	0.7
250D2	Velma silt loam, 10 to 18 percent slopes, eroded	1,435	0.4
257A	Clarksdale silt loam, 0 to 2 percent slopes	2,365	0.7
259C2	Assumption silt loam, 5 to 10 percent slopes, eroded	2,870	0.8
259D2	Assumption silt loam, 10 to 15 percent slopes, eroded	4,845	1.4
268B	Mt. Carroll silt loam, 2 to 5 percent slopes	210	0.1
274C2	Seaton silt loam, 5 to 10 percent slopes, eroded	425	0.1
274D	Seaton silt loam, 10 to 15 percent slopes	430	0.1
275A	Joy silt loam, 0 to 2 percent slopes	1,070	0.3
277B	Port Byron silt loam, 2 to 5 percent slopes	2,390	0.7
277C2	Port Byron silt loam, 5 to 10 percent slopes, eroded	1,005	0.3
278A	Stronghurst silt loam, 0 to 2 percent slopes	325	0.1
279B	Rozetta silt loam, 2 to 5 percent slopes	14,840	4.3
279C2	Rozetta silt loam, 5 to 10 percent slopes, eroded	12,460	3.6
279C3	Rozetta silty clay loam, 5 to 10 percent slopes, severely eroded	1,640	0.5
280B	Fayette silt loam, 2 to 5 percent slopes	60	*
280C2	Fayette silt loam, 5 to 10 percent slopes, eroded	40	*
280D2	Fayette silt loam, 10 to 15 percent slopes, eroded	3,825	1.1
280D3	Fayette silty clay loam, 10 to 15 percent slopes, severely eroded	715	0.2
280E2	Fayette silt loam, 15 to 20 percent slopes, eroded	400	0.1
386B	Downs silt loam, 2 to 5 percent slopes	6,520	1.9
386C2	Downs silt loam, 5 to 10 percent slopes, eroded	2,020	0.6
430B	Raddle silt loam, 2 to 5 percent slopes	560	0.2
505G	Dunbarton silt loam, 20 to 60 percent slopes	550	0.2
549D2	Marseilles silt loam, 10 to 18 percent slopes, eroded	1,060	0.3
549F	Marseilles silt loam, 18 to 30 percent slopes	1,450	0.4
549G	Marseilles silt loam, 30 to 60 percent slopes	1,115	0.3
567D3	Elkhart silty clay loam, 8 to 15 percent slopes, severely eroded	405	0.1
802B	Orthents, loamy, gently sloping	390	0.1
864	Pits, quarries	325	0.1
895E	Fayette-Westville complex, 12 to 20 percent slopes	585	0.2
936D2	Fayette-Hickory complex, 10 to 18 percent slopes, eroded	1,770	0.5
936G	Fayette-Hickory complex, 18 to 50 percent slopes	1,725	0.5
943D3	Seaton-Timula complex, 10 to 18 percent slopes, severely eroded	315	0.1
957D2	Elco-Atlas complex, 10 to 15 percent slopes, eroded	1,615	0.5
957D3	Elco-Atlas complex, 10 to 18 percent slopes, severely eroded	3,450	1.0
3074	Radford silt loam, frequently flooded	5,575	1.6
3107	Sawmill silty clay loam, frequently flooded	2,020	0.6
3107+	Sawmill silt loam, overwash	3,120	0.9

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
3405	Zook silty clay loam, frequently flooded	1,120	0.3
3415	Orion silt loam, frequently flooded	6,750	1.9
3451	Lawson silt loam, frequently flooded	5,360	1.5
	Water	725	0.2
	Total	348,100	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
17A	Keomah silt loam, 0 to 2 percent slopes (where drained)
36B	Tama silt loam, 2 to 5 percent slopes
36B2	Tama silt loam, 2 to 5 percent slopes, eroded
41A	Muscatine silt loam, 0 to 2 percent slopes
43A	Ipava silt loam, 0 to 2 percent slopes
43B	Ipava silt loam, 2 to 4 percent slopes
45	Denny silt loam (where drained)
61A	Atterberry silt loam, 0 to 2 percent slopes (where drained)
67	Harpster silty clay loam (where drained)
68	Sable silty clay loam (where drained)
68+	Sable silt loam, overwash (where drained)
81A	Littleton silt loam, 0 to 2 percent slopes
257A	Clarksdale silt loam, 0 to 2 percent slopes (where drained)
268B	Mt. Carroll silt loam, 2 to 5 percent slopes
275A	Joy silt loam, 0 to 2 percent slopes
277B	Port Byron silt loam, 2 to 5 percent slopes
278A	Stronghurst silt loam, 0 to 2 percent slopes (where drained)
279B	Rozetta silt loam, 2 to 5 percent slopes
280B	Fayette silt loam, 2 to 5 percent slopes
386B	Downs silt loam, 2 to 5 percent slopes
430B	Raddle silt loam, 2 to 5 percent slopes
3074	Radford silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3107	Sawmill silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3107+	Sawmill silt loam, overwash (where drained and either protected from flooding or not frequently flooded during the growing season)
3405	Zook silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3415	Orion silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3451	Lawson silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Bu	Tons	AUM*
7D3---------- Atlas	VIe	---	---	---	---	1.7	2.8
8D2---------- Hickory	IIIe	72	23	26	50	2.7	4.5
8D3---------- Hickory	IVe	---	---	---	---	2.5	4.1
8F---------- Hickory	VIe	---	---	---	---	2.4	4.0
8G---------- Hickory	VIIe	---	---	---	---	---	3.0
17A---------- Keomah	IIw	131	44	---	72	---	8.8
19D2---------- Sylvan	IIIe	101	32	48	59	---	7.5
19D3---------- Sylvan	IVe	93	29	44	55	---	6.9
36B---------- Tama	IIe	153	46	61	88	---	9.7
36B2---------- Tama	IIe	150	45	60	86	---	8.5
36C2---------- Tama	IIIe	146	43	58	84	---	9.2
36C3---------- Tama	IVe	141	41	56	80	---	8.8
36D2---------- Tama	IIIe	141	41	---	80	---	9.5
41A---------- Muscatine	I	170	57	---	102	---	11.4
43A---------- Ipava	I	163	52	66	91	---	---
43B---------- Ipava	IIe	161	51	65	90	---	---
45---------- Denny	IIIw	113	37	47	62	---	---
61A---------- Atterberry	I	149	44	60	85	5.6	---
67---------- Harpster	IIw	136	44	52	74	---	---

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Bu	Tons	AUM*
68, 68+---------- Sable	IIw	156	51	61	85	---	---
81A---------- Littleton	I	159	50	63	90	---	---
119D2---------- Elco	IIIe	101	33	42	58	4.0	6.6
119E2---------- Elco	IVe	94	---	39	54	3.7	6.1
250D2---------- Velma	IIIe	106	35	46	65	4.1	6.9
257A---------- Clarksdale	I	140	43	57	79	---	---
259C2---------- Assumption	IIIe	120	37	52	72	4.7	7.8
259D2---------- Assumption	IIIe	116	35	51	70	4.6	7.6
268B---------- Mt. Carroll	IIe	140	45	58	86	---	8.9
274C2---------- Seaton	IIIe	110	33	46	64	---	7.4
274D---------- Seaton	IIIe	105	32	46	63	---	7.1
275A---------- Joy	I	161	48	63	92	---	---
277B---------- Port Byron	IIe	148	45	60	87	5.5	9.2
277C2---------- Port Byron	IIIe	141	42	57	83	5.3	8.7
278A---------- Stronghurst	IIw	138	42	55	76	5.3	9.3
279B---------- Rozetta	IIe	130	40	53	72	5.1	8.6
279C2---------- Rozetta	IIIe	123	38	51	69	4.9	8.2
279C3---------- Rozetta	IVe	112	35	46	62	4.4	7.4
280B---------- Fayette	IIe	149	50	---	89	---	10.5
280C2---------- Fayette	IIIe	140	47	---	84	---	9.8

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Bu	Tons	AUM*
280D2--- Fayette	IIIe	115	35	---	65	---	7.5
280D3--- Fayette	IVe	110	33	---	60	---	7.5
280E2--- Fayette	IVe	114	38	---	68	---	8.0
386B--- Downs	IIe	147	43	58	82	---	9.2
386C2--- Downs	IIIe	139	40	55	78	---	8.7
430B--- Raddle	IIe	148	45	58	82	5.7	9.6
505G--- Dunbarton	VIIe	---	---	---	---	---	---
549D2--- Marseilles	IVe	90	---	40	56	3.8	6.3
549F--- Marseilles	VIIe	---	---	---	---	---	5.4
549G--- Marseilles	VIIe	---	---	---	---	---	---
567D3--- Elkhart	IVe	110	---	44	61	4.2	7.1
802B. Orthents							
864. Pits							
895E--- Fayette-Westville	IVe	110	---	---	64	---	7.3
936D2--- Fayette-Hickory	IIIe	96	31	---	60	---	6.5
936G--- Fayette-Hickory	VIIe	---	---	---	---	---	5.3
943D3--- Seaton-Timula	IVe	93	29	---	56	---	6.3
957D2--- Elco-Atlas	IVe	---	---	32	50	4.0	6.5
957D3--- Elco-Atlas	VIe	---	---	---	---	1.7	2.8
3074--- Radford	IIIw	100	32	---	59	---	6.5

See footnote at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Oats	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Bu	Tons	AUM*
3107, 3107+----- Sawmill	IIIw	132	42	---	---	---	---
3405---------- Zook	IIIw	92	32	---	---	2.0	2.2
3415---------- Orion	IIIw	80	26	---	58	---	---
3451---------- Lawson	IIIw	120	39	---	72	---	---

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
7D3---------- Atlas	4C	Slight	Slight	Moderate	Moderate	White oak----------	70	4	Green ash, pin oak, red maple, Austrian pine.
						Northern red oak----	70	4	
						Bur oak----------	70	4	
						Green ash----------	---	---	
8D2, 8D3-------- Hickory	5A	Slight	Slight	Slight	Slight	White oak----------	85	5	White oak, yellow-poplar, eastern white pine, red pine, sugar maple, black walnut.
						Northern red oak----	85	5	
						Black oak----------	---	---	
						Green ash----------	---	---	
						Bitternut hickory---	---	---	
						Yellow-poplar-------	95	7	
8F---------- Hickory	5R	Moderate	Moderate	Slight	Slight	White oak----------	85	5	White oak, yellow-poplar, eastern white pine, red pine, sugar maple, black walnut.
						Northern red oak----	85	5	
						Black oak----------	---	---	
						Green ash----------	---	---	
						Bitternut hickory---	---	---	
						Yellow-poplar-------	95	7	
8G---------- Hickory	5R	Severe	Severe	Slight	Slight	White oak----------	85	5	White oak, yellow-poplar, eastern white pine, red pine, sugar maple, black walnut.
						Northern red oak----	85	5	
						Black oak----------	---	---	
						Green ash----------	---	---	
						Bitternut hickory---	---	---	
						Yellow-poplar-------	95	7	
19D3---------- Sylvan	6A	Slight	Slight	Slight	Slight	Yellow-poplar-------	90	6	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
						White oak----------	80	4	
						Northern red oak----	80	4	
						Black walnut--------	---	---	
119E2---------- Elco	4R	Moderate	Moderate	Moderate	Slight	White oak----------	80	4	White oak, northern red oak, black walnut, green ash, eastern white pine, white ash.
						Northern red oak----	---	---	
						Black walnut--------	---	---	
279C3---------- Rozetta	4A	Slight	Slight	Slight	Slight	White oak----------	80	4	Eastern white pine, northern red oak, green ash, yellow-poplar.
						Northern red oak----	80	4	
						Yellow-poplar-------	90	6	
						Black walnut--------	---	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
280D3---------- Fayette	4A	Slight	Slight	Slight	Slight	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Eastern white pine, northern red oak, green ash, yellow-poplar.
280E2---------- Fayette	4R	Moderate	Moderate	Slight	Slight	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Northern red oak, yellow-poplar, eastern white pine, green ash.
505G---------- Dunbarton	4R	Severe	Severe	Severe	Severe	Northern red oak---- Black oak---------- White oak---------- Shagbark hickory----	61 --- --- ---	4 --- --- ---	Eastern white pine, jack pine, eastern redcedar, red pine.
549D2---------- Marseilles	3A	Slight	Slight	Slight	Slight	White oak---------- Northern red oak---- Black oak---------- White ash----------	66 66 --- ---	3 3 --- ---	White oak, northern red oak, black oak, white ash, eastern white pine, Scotch pine, black walnut.
549F---------- Marseilles	3R	Moderate	Moderate	Slight	Slight	White oak---------- Northern red oak---- Black oak---------- White ash----------	66 66 --- ---	3 3 --- ---	White oak, northern red oak, black oak, white ash, eastern white pine, Scotch pine, black walnut.
549G---------- Marseilles	3R	Severe	Severe	Slight	Slight	White oak---------- Northern red oak---- Black oak---------- White ash----------	66 66 --- ---	3 3 --- ---	White oak, northern red oak, black oak, white ash, eastern white pine, Scotch pine, black walnut.
895E: Fayette--------	4R	Moderate	Moderate	Slight	Slight	White oak---------- Northern red oak---- Yellow-poplar------- Black walnut--------	80 80 90 ---	4 4 6 ---	Eastern white pine, northern red oak, green ash, yellow-poplar.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
895E:									
Westville------	4R	Moderate	Moderate	Moderate	Slight	White oak----------	80	4	White oak, black walnut, northern red oak, green ash, sugar maple, eastern white pine, red pine.
						Northern red oak----	80	4	
						Black walnut--------	---	---	
936D2:									
Fayette--------	4A	Slight	Slight	Slight	Slight	White oak----------	80	4	Northern red oak, yellow-poplar, eastern white pine, green ash.
						Northern red oak----	80	4	
						Yellow-poplar-------	90	6	
						Black walnut--------	---	---	
Hickory--------	5A	Slight	Slight	Slight	Slight	White oak----------	85	5	White oak, yellow-poplar, eastern white pine, red pine, sugar maple, black walnut.
						Northern red oak----	85	5	
						Black oak----------	---	---	
						Green ash----------	---	---	
						Bitternut hickory---	---	---	
						Yellow-poplar-------	95	7	
936G:									
Fayette--------	4R	Moderate	Moderate	Slight	Slight	White oak----------	80	4	Eastern white pine, northern red oak, green ash, yellow-poplar.
						Northern red oak----	80	4	
						Yellow-poplar-------	90	6	
						Black walnut--------	---	---	
Hickory--------	5R	Severe	Severe	Slight	Slight	White oak----------	85	5	White oak, yellow-poplar, eastern white pine, red pine, sugar maple, black walnut.
						Northern red oak----	85	5	
						Black oak----------	---	---	
						Green ash----------	---	---	
						Bitternut hickory---	---	---	
						Yellow-poplar-------	95	7	
943D3:									
Seaton---------	6A	Slight	Slight	Slight	Slight	Yellow-poplar-------	90	6	White oak, northern red oak, black walnut, green ash, red pine, sugar maple.
						White oak----------	90	5	
						Northern red oak----	80	4	
						Black walnut--------	---	---	
Timula---------	4A	Slight	Slight	Slight	Slight	White oak----------	70	4	Eastern white pine, red pine, Scotch pine, white oak.
						Northern red oak----	---	---	
						Green ash----------	---	---	
						Bur oak------------	---	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Productivity class*	
957D2, 957D3:									
Elco----------	4A	Slight	Slight	Slight	Slight	White oak----------	80	4	White oak, northern red oak, black walnut, green ash, eastern white pine, white ash.
						Northern red oak----	---	---	
						Black walnut--------	---	---	
Atlas----------	4C	Slight	Slight	Moderate	Moderate	White oak----------	70	4	Green ash, pin oak, red maple, Austrian pine.
						Northern red oak----	70	4	
						Bur oak------------	70	4	
						Green ash----------	---	---	

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(Only the soils suitable for windbreaks and environmental plantings are listed. The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
7D3---------- Atlas	American cranberrybush, silky dogwood, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osage-orange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
8D2, 8D3, 8F, 8G-- Hickory	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
17A---------- Keomah	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Eastern white pine, pin oak.
19D2, 19D3-------- Sylvan	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
36B, 36B2, 36C2, 36C3---------- Tama	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Blue spruce, northern whitecedar, Washington hawthorn, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
36D2---------- Tama	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
41A---------- Muscatine	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Eastern white pine, pin oak.
43A, 43B---------- Ipava	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Eastern white pine, pin oak.
45---------- Denny	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, northern whitecedar, Norway spruce, blue spruce, white fir, Washington hawthorn.	Eastern white pine----	Pin oak.
61A---------- Atterberry	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Eastern white pine, pin oak.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
67---------- Harpster	Nannyberry viburnum, Washington hawthorn.	White spruce, northern whitecedar, eastern redcedar, green ash, Osage-orange.	Black willow----------	---
68, 68+---------- Sable	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine----	Pin oak.
81A---------- Littleton	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Eastern white pine, Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Pin oak.
119D2, 119E2------ Elco	Silky dogwood, honeysuckle, Amur privet, American cranberrybush.	Northern whitecedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
250D2---------- Velma	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
257A---------- Clarksdale	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce---------	Eastern white pine, pin oak.
259C2, 259D2------ Assumption	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
268B---------- Mt. Carroll	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
274C2, 274D------- Seaton	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
275A---------- Joy	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Eastern white pine, pin oak.
277B, 277C2------- Port Byron	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Blue spruce, northern whitecedar, Washington hawthorn, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
278A---------- Stronghurst	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Eastern white pine, pin oak.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
279B, 279C2, 279C3---- Rozetta	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
280B, 280C2, 280D2, 280D3, 280E2---- Fayette	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
386B, 386C2------- Downs	American cranberrybush, Amur honeysuckle, autumn-olive, silky dogwood.	Blue spruce, northern whitecedar, Washington hawthorn, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
430B---------- Raddle	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
549D2, 549F, 549G- Marseilles	Amur privet, American cranberrybush, silky dogwood, Amur honeysuckle.	Blue spruce, Washington hawthorn, northern whitecedar, white fir, Austrian pine.	Norway spruce---------	Pin oak, eastern white pine.
567D3---------- Elkhart	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
895E: Fayette----------	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Westville--------	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
936D2, 936G: Fayette----------	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Hickory----------	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
943D3:				
Seaton	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Timula	Osage-orange, Russian-olive, eastern redcedar, Washington hawthorn.	Honeylocust, northern catalpa, green ash.	---	---
957D2, 957D3:				
Elco	Silky dogwood, honeysuckle, Amur privet, American cranberrybush.	Northern whitecedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Atlas	American cranberrybush, silky dogwood, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osage-orange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
3074 Radford	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
3107, 3107+ Sawmill	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
3405 Zook	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Norway spruce, northern whitecedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
3415 Orion	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
3451 Lawson	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
7D3---------- Atlas	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty, slope.
8D2, 8D3---------- Hickory	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
8F---------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
8G---------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
17A---------- Keomah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight----------	Slight.
19D2, 19D3---------- Sylvan	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
36B, 36B2---------- Tama	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
36C2, 36C3---------- Tama	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
36D2---------- Tama	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
41A---------- Muscatine	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight----------	Slight.
43A, 43B---------- Ipava	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
45---------- Denny	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
61A---------- Atterberry	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
67---------- Harpster	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
68, 68+---------- Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
81A---------- Littleton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
119D2---------- Elco	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
119E2---------- Elco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
250D2---------- Velma	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
257A---------- Clarksdale	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
259C2---------- Assumption	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight----------	Slight.
259D2---------- Assumption	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
268B---------- Mt. Carroll	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
274C2---------- Seaton	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
274D---------- Seaton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
275A---------- Joy	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight----------	Slight.
277B---------- Port Byron	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
277C2---------- Port Byron	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
278A---------- Stronghurst	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
279B---------- Rozetta	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
279C2, 279C3---------- Rozetta	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
280B---------- Fayette	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
280C2---------- Fayette	Slight----------	Slight----------	Severe: slope.	Severe: erodes easily.	Slight.
280D2, 280D3---------- Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
280E2---------- Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
386B---------- Downs	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
386C2---------- Downs	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
430B---------- Raddle	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
505G---------- Dunbarton	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, erodes easily.	Severe: slope, thin layer, area reclaim.
549D2---------- Marseilles	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope, depth to rock.
549F---------- Marseilles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
549G---------- Marseilles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
567D3---------- Elkhart	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
802B---------- Orthents	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope.	Slight----------	Slight.
864. Pits					
895E:					
Fayette----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Westville----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
936D2:					
Fayette----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Hickory----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
936G:					
Fayette----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hickory----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
943D3:					
Seaton----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Timula----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
957D2:					
Elco----------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
957D2:					
Atlas	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty, slope.
957D3:					
Elco	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Atlas	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty, slope.
3074 Radford	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
3107, 3107+ Sawmill	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
3405 Zook	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
3415 Orion	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
3451 Lawson	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
7D3---------- Atlas	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
8D2, 8D3---------- Hickory	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
8F---------- Hickory	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
8G---------- Hickory	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
17A---------- Keomah	Good	Good	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair.
19D2, 19D3---------- Sylvan	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
36B, 36B2---------- Tama	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
36C2, 36C3---------- Tama	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
36D2---------- Tama	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
41A---------- Muscatine	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
43A---------- Ipava	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
43B---------- Ipava	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
45---------- Denny	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
61A---------- Atterberry	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
67---------- Harpster	Fair	Fair	Good	Fair	Fair	Good	Fair	Fair	Fair	Fair.
68, 68+---------- Sable	Fair	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
81A---------- Littleton	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
119D2---------- Elco	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
119E2---------- Elco	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
250D2--- Velma	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
257A--- Clarksdale	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
259C2, 259D2--- Assumption	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
268B--- Mt. Carroll	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
274C2, 274D--- Seaton	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
275A--- Joy	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
277B, 277C2--- Port Byron	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
278A--- Stronghurst	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
279B--- Rozetta	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
279C2, 279C3--- Rozetta	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
280B--- Fayette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
280C2, 280D2, 280D3--- Fayette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
280E2--- Fayette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
386B--- Downs	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
386C2--- Downs	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
430B--- Raddle	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
505G--- Dunbarton	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
549D2--- Marseilles	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
549F, 549G--- Marseilles	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
567D3--- Elkhart	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
802B. Orthents										
864. Pits										
895E:										
Fayette	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Westville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
936D2:										
Fayette	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Hickory	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
936G:										
Fayette	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
Hickory	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
943D3:										
Seaton	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Timula	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
957D2, 957D3:										
Elco	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Atlas	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
3074 Radford	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
3107, 3107+ Sawmill	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
3405 Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
3415 Orion	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Good.
3451 Lawson	Good	Good	Fair	Good	Good	Fair	Fair	Good	Good	Fair.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
7D3---------- Atlas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, droughty, slope.
8D2, 8D3---------- Hickory	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
8F, 8G---------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
17A---------- Keomah	Severe: wetness.	Severe: shrink-swell.	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
19D2, 19D3-------- Sylvan	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
36B, 36B2--------- Tama	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
36C2, 36C3-------- Tama	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
36D2---------- Tama	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
41A---------- Muscatine	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
43A, 43B---------- Ipava	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
45---------- Denny	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
61A---------- Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
67---------- Harpster	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
68, 68+---------- Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
81A---------- Littleton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
119D2---------- Elco	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
119E2---------- Elco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
250D2---------- Velma	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
257A---------- Clarksdale	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
259C2---------- Assumption	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
259D2---------- Assumption	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
268B---------- Mt. Carroll	Moderate: wetness.	Slight---------	Moderate: wetness.	Slight---------	Severe: low strength, frost action.	Slight.
274C2---------- Seaton	Slight---------	Slight---------	Slight---------	Moderate: slope.	Severe: low strength, frost action.	Slight.
274D---------- Seaton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
275A---------- Joy	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength, frost action.	Slight.
277B---------- Port Byron	Moderate: wetness.	Slight---------	Moderate: wetness.	Slight---------	Severe: low strength, frost action.	Slight.
277C2---------- Port Byron	Moderate: wetness.	Slight---------	Moderate: wetness.	Moderate: slope.	Severe: low strength, frost action.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
278A---------- Stronghurst	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
279B---------- Rozetta	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
279C2, 279C3------ Rozetta	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
280B---------- Fayette	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
280C2---------- Fayette	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
280D2, 280D3------ Fayette	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
280E2---------- Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
386B---------- Downs	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
386C2---------- Downs	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
430B---------- Raddle	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength, frost action.	Slight.
505G---------- Dunbarton	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, shrink-swell.	Severe: slope, thin layer, area reclaim.
549D2---------- Marseilles	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope, depth to rock.
549F, 549G-------- Marseilles	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
567D3---------- Elkhart	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
802B---------- Orthents	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
864. Pits						
895E: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Westville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
936D2: Fayette	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Hickory	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
936G: Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
943D3: Seaton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Timula	Moderate: cutbanks cave, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
957D2, 957D3: Elco	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Atlas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, droughty, slope.
3074 Radford	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
3107, 3107+ Sawmill	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
3405---------- Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, flooding.
3415---------- Orion	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
3451---------- Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7D3---------- Atlas	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
8D2, 8D3---------- Hickory	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
8F, 8G---------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
17A---------- Keomah	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
19D2, 19D3---------- Sylvan	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
36B, 36B2---------- Tama	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
36C2, 36C3---------- Tama	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
36D2---------- Tama	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
41A---------- Muscatine	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
43A, 43B---------- Ipava	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
45---------- Denny	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
61A---------- Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
67---------- Harpster	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
68, 68+---------- Sable	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: hard to pack, ponding.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
81A---------- Littleton	Severe: wetness.	Severe: wetness.	Severe: wetness	Severe: wetness.	Poor: wetness.
119D2---------- Elco	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
119E2---------- Elco	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope.
250D2---------- Velma	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
257A---------- Clarksdale	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
259C2---------- Assumption	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey.
259D2---------- Assumption	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey.
268B---------- Mt. Carroll	Moderate: wetness.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Good.
274C2---------- Seaton	Slight----------	Severe: slope.	Slight----------	Slight----------	Good.
274D---------- Seaton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
275A---------- Joy	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness.
277B---------- Port Byron	Moderate: wetness.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Good.
277C2---------- Port Byron	Moderate: wetness.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Good.
278A---------- Stronghurst	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
279B---------- Rozetta	Moderate: wetness.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
279C2, 279C3-------- Rozetta	Moderate: wetness.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
280B---------- Fayette	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
280C2---------- Fayette	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
280D2, 280D3-------- Fayette	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
280E2---------- Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
386B---------- Downs	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
386C2---------- Downs	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
430B---------- Raddle	Slight----------	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
505G---------- Dunbarton	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, too clayey, hard to pack.
549D2---------- Marseilles	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock.	Poor: depth to rock.
549F, 549G---------- Marseilles	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope, wetness.	Severe: depth to rock, wetness, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
567D3---------- Elkhart	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
802B---------- Orthents	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
864. Pits					
895E: Fayette----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Westville----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
936D2:					
Fayette	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Hickory	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
936G:					
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
943D3:					
Seaton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Timula	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
957D2, 957D3:					
Elco	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
Atlas	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
3074 Radford	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3107, 3107+ Sawmill	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3405 Zook	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
3415 Orion	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3451 Lawson	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
7D3 Atlas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
8D2, 8D3 Hickory	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
8F Hickory	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
8G Hickory	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
17A Keomah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
19D2, 19D3 Sylvan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
36B, 36B2, 36C2, 36C3- Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
36D2 Tama	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
41A Muscatine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
43A, 43B Ipava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
45 Denny	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
61A Atterberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
67 Harpster	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
68, 68+ Sable	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
81A Littleton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
119D2 Elco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
119E2---------- Elco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
250D2---------- Velma	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
257A---------- Clarksdale	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
259C2---------- Assumption	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
259D2---------- Assumption	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer, slope.
268B---------- Mt. Carroll	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
274C2---------- Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
274D---------- Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
275A---------- Joy	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
277B, 277C2---------- Port Byron	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
278A---------- Stronghurst	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
279B, 279C2, 279C3---- Rozetta	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
280B, 280C2---------- Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
280D2, 280D3---------- Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
280E2---------- Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
386B, 386C2---------- Downs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
430B---------- Raddle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
505G---------- Dunbarton	Poor: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
549D2---------- Marseilles	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, slope.
549F---------- Marseilles	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
549G---------- Marseilles	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
567D3---------- Elkhart	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
802B---------- Orthents	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
864. Pits				
895E: Fayette----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Westville----------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
936D2: Fayette----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Hickory----------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
936G: Fayette----------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hickory----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
943D3: Seaton----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Timula----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
957D2, 957D3: Elco----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Atlas----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
3074---------- Radford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
3107, 3107+---------- Sawmill	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3405---------- Zook	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3415---------- Orion	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
3451---------- Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
7D3---------- Atlas	Severe: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, droughty.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
8D2, 8D3, 8F, 8G-- Hickory	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
17A---------- Keomah	Slight---------	Moderate: wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
19D2, 19D3-------- Sylvan	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
36B, 36B2, 36C2, 36C3---------- Tama	Moderate: seepage, slope.	Slight---------	Deep to water	Slope----------	Erodes easily	Erodes easily.
36D2---------- Tama	Severe: slope.	Slight---------	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
41A---------- Muscatine	Moderate: seepage.	Moderate: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
43A---------- Ipava	Slight---------	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
43B---------- Ipava	Moderate: slope.	Severe: wetness.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
45---------- Denny	Slight---------	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
61A---------- Atterberry	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
67---------- Harpster	Moderate: seepage.	Severe: piping, ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
68, 68+---------- Sable	Moderate: seepage.	Severe: ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
81A---------- Littleton	Moderate: seepage.	Severe: wetness, piping.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
119D2, 119E2------ Elco	Severe: slope.	Moderate: piping, wetness.	Frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily.
250D2---------- Velma	Severe: slope.	Moderate: thin layer.	Deep to water	Slope----------	Slope----------	Slope.
257A---------- Clarksdale	Slight---------	Severe: wetness.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
259C2---------- Assumption	Moderate: seepage, slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
259D2---------- Assumption	Severe: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
268B---------- Mt. Carroll	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
274C2---------- Seaton	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
274D---------- Seaton	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
275A---------- Joy	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
277B, 277C2------- Port Byron	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
278A---------- Stronghurst	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
279B, 279C2------- Rozetta	Moderate: seepage, slope.	Slight---------	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
279C3---------- Rozetta	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
280B---------- Fayette	Moderate: seepage, slope.	Slight---------	Deep to water	Slope----------	Erodes easily	Erodes easily.
280C2---------- Fayette	Moderate: seepage, slope.	Slight---------	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
280D2, 280D3, 280E2---------- Fayette	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
386B, 386C2------- Downs	Moderate: seepage, slope.	Slight---------	Deep to water	Slope----------	Erodes easily	Erodes easily.
430B---------- Raddle	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
505G---------- Dunbarton	Severe: depth to rock, seepage, slope.	Severe: hard to pack, thin layer.	Deep to water	Slope, thin layer, erodes easily.	Slope, area reclaim, depth to rock.	Slope, erodes easily, depth to rock.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
549D2, 549F, 549G-- Marseilles	Severe: slope.	Severe: thin layer.	Percs slowly, depth to rock, frost action.	Slope, wetness, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
567D3---------- Elkhart	Severe: slope.	Moderate: piping.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
802B---------- Orthents	Moderate: seepage, slope.	Slight---------	Deep to water	Slope----------	Favorable------	Favorable.
864. Pits						
895E: Fayette----------	Severe: slope.	Slight---------	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
Westville--------	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
936D2: Fayette----------	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Hickory----------	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
936G: Fayette----------	Severe: slope.	Slight---------	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
Hickory----------	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
943D3: Seaton----------	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Timula----------	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
957D2: Elco----------	Severe: slope.	Moderate: piping, wetness.	Frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily.
Atlas----------	Severe: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, droughty.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
957D3: Elco----------	Severe: slope.	Moderate: piping, wetness.	Frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily.
Atlas----------	Severe: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, droughty.	Slope, wetness.	Wetness, slope.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
3074---------- Radford	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness--------	Wetness.
3107, 3107+------- Sawmill	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness--------	Wetness.
3405---------- Zook	Slight---------	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
3415---------- Orion	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
3451---------- Lawson	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
7D3---------- Atlas	0-8	Silty clay loam.	CH, CL	A-7	0	0	100	100	95-100	75-100	40-60	25-40
	8-45	Silty clay loam, clay, clay loam.	CH	A-7	0	0	100	95-100	95-100	75-95	50-70	30-45
	45-60	Clay loam, clay, loam.	CH, CL	A-6, A-7	0	0	95-100	90-100	90-100	65-95	35-55	20-30
8D2---------- Hickory	0-6	Silt loam-----	CL	A-6, A-4	0	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	6-51	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-1	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	51-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-1	0-5	85-100	75-95	70-95	60-80	20-40	5-20
8D3---------- Hickory	0-6	Clay loam-----	CL	A-6, A-7	0	0-5	95-100	90-100	80-95	70-85	30-50	15-30
	6-44	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-1	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	44-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-1	0-5	85-100	75-95	70-95	60-80	20-40	5-20
8F---------- Hickory	0-12	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	0-5	95-100	90-100	90-100	75-95	20-35	3-15
	12-55	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-1	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	55-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-1	0-5	85-100	75-95	70-95	60-80	20-40	5-20
8G---------- Hickory	0-9	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	0-5	95-100	90-100	90-100	75-95	20-35	3-15
	9-55	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-1	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	55-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-1	0-5	85-100	75-95	70-95	60-80	20-40	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
17A----------	0-11	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
Keomah	11-55	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	45-60	30-45
	55-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-30
19D2----------	0-5	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
Sylvan	5-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	20-30
	30-60	Silt loam, silt.	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	95-100	20-40	5-20
19D3----------	0-8	Silty clay loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	20-30
Sylvan	8-28	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	20-30
	28-60	Silt loam, silt.	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	95-100	20-40	5-20
36B----------	0-16	Silt loam-----	ML, CL	A-6, A-7	0	0	100	100	100	95-100	35-45	10-20
Tama	16-60	Silty clay loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
36B2----------	0-8	Silt loam-----	ML, CL	A-6, A-7	0	0	100	100	100	95-100	35-45	10-20
Tama	8-43	Silty clay loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	43-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
36C2----------	0-6	Silt loam-----	ML, CL	A-6, A-7	0	0	100	100	100	95-100	35-45	10-20
Tama	6-39	Silty clay loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	39-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
36C3----------	0-8	Silty clay loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
Tama	8-20	Silty clay loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	20-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
36D2----------	0-8	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
Tama	8-51	Silty clay loam.	ML	A-6, A-7	0	0	100	100	100	95-100	35-50	10-20
	51-60	Silty clay loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
41A----------	0-18	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
Muscatine	18-48	Silty clay loam.	CL	A-7	0	0	100	100	100	95-100	40-50	20-30
	48-60	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
43A----------	0-11	Silt loam-----	CL	A-6	0	0	100	100	95-100	90-100	25-40	10-20
Ipava	11-60	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	95-100	90-100	45-70	25-40
43B----------	0-17	Silt loam-----	CL	A-6	0	0	100	100	95-100	90-100	25-40	10-20
Ipava	17-58	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	95-100	90-100	45-70	25-40
	58-60	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	90-100	25-40	5-20
45----------	0-8	Silt loam-----	CL	A-6, A-4	0	0	100	100	95-100	95-100	30-40	8-15
Denny	8-17	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	5-15
	17-45	Silty clay loam, silty clay.	CL, CH	A-7, A-6	0	0	100	100	95-100	95-100	35-60	15-35
	45-60	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	95-100	95-100	25-40	11-20
61A----------	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	25-40	5-15
Atterberry	8-16	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	16-50	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	0	100	100	95-100	95-100	35-55	15-30
	50-60	Silt loam, loam.	CL	A-6	0	0	100	100	95-100	95-100	30-40	10-20
67----------	0-21	Silty clay loam.	CL, CH	A-7	0	0	100	95-100	95-100	90-100	45-60	20-35
Harpster	21-35	Silty clay loam.	CL, CH	A-7	0	0	100	95-100	95-100	85-100	40-60	20-35
	35-44	Silty clay loam, silt loam, loam.	CL, CH	A-6, A-7	0	0	100	95-100	95-100	70-100	35-55	20-35
	44-60	Stratified sandy loam to clay loam.	CL, CL-ML, SC, SC-SM	A-4, A-6, A-7	0	0	100	95-100	95-100	45-95	20-50	5-25
68----------	0-23	Silty clay loam.	CL, CH, ML, MH	A-7	0	0	100	100	95-100	95-100	41-65	15-35
Sable	23-47	Silty clay loam.	CL, CH, ML, MH	A-7	0	0	100	100	95-100	95-100	41-65	15-35
	47-60	Silty clay loam, silt loam.	CL, CH	A-7	0	0	100	100	95-100	95-100	40-55	20-35
68+----------	0-14	Silt loam-----	CL	A-6, A-7	0	0	100	100	95-100	95-100	30-45	10-20
Sable	14-56	Silty clay loam.	CL, CH, ML, MH	A-7	0	0	100	100	95-100	95-100	41-65	15-35
	56-60	Silty clay loam, silt loam.	CL, CH	A-7	0	0	100	100	95-100	95-100	40-55	20-35
81A----------	0-7	Silt loam-----	CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	7-20
Littleton	7-55	Silt loam-----	CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	7-20
	55-60	Silt loam-----	CL-ML, CL	A-4, A-6, A-7	0	0	100	100	95-100	80-100	20-45	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	> 10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
119D2---------	0-11	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
Elco	11-34	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	95-100	85-100	25-45	10-30
	34-60	Silty clay loam, loam, clay.	CL	A-7, A-6	0	0	100	90-100	80-100	60-95	25-50	10-30
119E2---------	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
Elco	9-26	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	95-100	85-100	25-45	10-30
	26-60	Silty clay loam, loam, clay.	CL	A-7, A-6	0	0	100	90-100	80-100	60-95	25-50	10-30
250D2---------	0-7	Silt loam-----	CL	A-4, A-6	0	0	100	100	90-100	70-90	20-40	8-25
Velma	7-45	Clay loam, loam, silty clay loam.	CL	A-7, A-6	0-1	0-5	100	85-100	80-95	55-75	30-50	15-30
	45-60	Loam, clay loam.	CL, ML	A-4, A-6, A-2	0-1	0-5	90-100	75-100	60-90	30-80	20-40	3-20
257A----------	0-8	Silt loam-----	CL	A-6	0	0	100	100	95-100	90-100	25-40	10-20
Clarksdale	8-16	Silt loam-----	CL	A-6, A-4	0	0	100	100	95-100	90-100	20-35	8-18
	16-44	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	90-100	40-65	25-40
	44-60	Silt loam, silty clay loam.	CL	A-6	0	0	95-100	95-100	95-100	90-100	25-40	10-25
259C2---------	0-8	Silt loam-----	CL	A-6, A-4	0	0	100	100	95-100	90-100	25-40	8-20
Assumption	8-32	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	90-100	30-50	10-30
	32-60	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0	0-5	100	95-100	90-100	70-90	35-50	20-35
259D2---------	0-8	Silt loam-----	CL	A-6, A-4	0	0	100	100	95-100	90-100	25-40	8-20
Assumption	8-27	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	95-100	90-100	30-50	10-30
	27-60	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0	0-5	100	95-100	90-100	70-90	35-50	20-35
268B----------	0-16	Silt loam-----	CL	A-4, A-6	0	0	100	100	100	95-100	25-40	7-18
Mt. Carroll	16-47	Silt loam-----	CL	A-4, A-6	0	0	100	100	100	90-100	25-40	7-18
	47-60	Silt loam-----	CL	A-6, A-4	0	0	100	100	100	95-100	25-40	8-20
274C2---------	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	20-35	5-15
Seaton	9-56	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	90-100	25-40	5-20
	56-60	Silt loam, silt.	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-20
274D----------	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	20-35	5-15
Seaton	8-55	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	90-100	25-40	5-20
	55-60	Silt loam, silt.	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
275A---------- Joy	0-19	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	20-40	5-20
	19-54	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	25-40	10-20
	54-60	Silt loam, loam, very fine sandy loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0	100	100	100	40-100	20-35	5-15
277B---------- Port Byron	0-16	Silt loam-----	CL, ML	A-6, A-4	0	0	100	100	100	95-100	25-40	7-18
	16-50	Silt loam-----	CL	A-6, A-4	0	0	100	100	100	95-100	25-40	7-18
	50-60	Silt loam-----	CL	A-4, A-6	0	0	100	100	100	90-100	25-40	7-17
277C2---------- Port Byron	0-9	Silt loam-----	CL, ML	A-6, A-4	0	0	100	100	100	95-100	25-40	7-18
	9-60	Silt loam-----	CL	A-6, A-4	0	0	100	100	100	95-100	25-40	7-18
278A---------- Stronghurst	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	7-17	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	17-48	Silty clay loam.	CL, CH	A-7	0	0	100	100	100	98-100	40-55	20-35
	48-60	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	95-100	25-40	5-20
279B---------- Rozetta	0-9	Silt loam-----	CL	A-4, A-6	0	0	100	100	95-100	95-100	24-35	8-15
	9-13	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	95-100	20-30	5-15
	13-60	Silty clay loam.	CL	A-7, A-6	0	0	100	100	95-100	95-100	35-50	15-30
279C2---------- Rozetta	0-7	Silt loam-----	CL	A-4, A-6	0	0	100	100	95-100	95-100	24-35	8-15
	7-50	Silty clay loam.	CL	A-7, A-6	0	0	100	100	95-100	95-100	35-50	15-30
	50-60	Silt loam-----	CL	A-6, A-4	0	0	100	100	95-100	85-100	25-40	7-20
279C3---------- Rozetta	0-7	Silty clay loam.	ML, CL	A-6, A-7	0	0	100	100	95-100	95-100	35-45	10-20
	7-30	Silty clay loam.	ML	A-6, A-7	0	0	100	100	95-100	95-100	35-50	10-20
	30-60	Silt loam-----	CL	A-6, A-4	0	0	100	100	90-100	85-100	25-40	7-20
280B---------- Fayette	0-11	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	11-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
280C2---------- Fayette	0-7	Silt loam-----	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-25
	7-50	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	50-60	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
280D2---------- Fayette	0-9	Silt loam-----	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-25
	9-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	38-60	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
280D3---------- Fayette	0-8	Silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	8-36	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	36-60	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
280E2----------	0-12	Silt loam-----	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-25
Fayette	12-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
386B----------	0-13	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
Downs	13-48	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	48-60	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	11-20
386C2---------	0-6	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
Downs	6-32	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-25
	32-60	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	11-20
430B----------	0-17	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-20
Raddle	17-50	Silt loam, loam.	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-20
	50-60	Silty clay loam, clay loam.	CL, ML	A-6, A-7	0	0	100	100	95-100	90-100	35-50	10-25
505G----------	0-4	Silt loam-----	CL	A-6, A-4	---	0-7	85-100	80-100	80-100	70-95	25-35	7-15
Dunbarton	4-10	Silty clay loam, silt loam.	CL, CH	A-6, A-7	---	0-8	70-100	70-100	70-100	70-95	35-60	15-35
	10-16	Clay, silty clay.	CH, CL	A-7	---	0-8	70-100	70-100	70-100	70-95	45-90	25-60
	16	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
549D2---------	0-12	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
Marseilles	12-21	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	90-100	85-100	35-50	15-25
	21-32	Clay loam, silty clay loam, silt loam.	CL, CH	A-7	0-5	0-20	90-100	90-100	85-100	80-100	40-60	15-30
	32-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
549F----------	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
Marseilles	9-15	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	90-100	85-100	35-50	15-25
	15-28	Clay loam, silty clay loam, silt loam.	CL, CH	A-7	0-5	0-20	90-100	90-100	85-100	80-100	40-60	15-30
	28-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
549G----------	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
Marseilles	9-13	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	90-100	85-100	35-50	15-25
	13-28	Clay loam, silty clay loam, silt loam.	CL, CH	A-7	0-5	0-20	90-100	90-100	85-100	80-100	40-60	15-30
	28-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
567D3---------	0-8	Silty clay loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	18-30
Elkhart	8-31	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	18-30
	31-60	Silt loam, silt.	CL	A-6, A-4	0	0	100	100	95-100	95-100	20-37	8-20
802B----------	0-60	Clay loam-----	---	---	---	---	---	---	---	---	---	15-30
Orthents	60-80	Variable------	---	---	---	---	---	---	---	---	---	---
864. Pits												
895E:												
Fayette------	0-14	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	14-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
Westville----	0-5	Silt loam, loam.	CL-ML, CL	A-6, A-4	0	0	100	100	90-100	70-90	25-40	4-15
	5-54	Clay loam, sandy clay loam.	CL	A-6, A-7-6	0	0-5	90-100	90-100	80-90	60-90	30-45	11-19
	54-60	Sandy loam, loam, gravelly sandy loam.	SC, SC-SM, CL, ML	A-4, A-2, A-6	0-1	0-5	90-100	90-100	60-90	30-70	15-30	3-11
936D2:												
Fayette------	0-8	Silt loam-----	CL	A-6, A-7	0	0	100	100	100	95-100	30-45	10-25
	8-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
Hickory------	0-12	Silt loam-----	CL	A-6, A-4	0	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	12-51	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-1	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	51-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-1	0-5	85-100	75-95	70-95	60-80	20-40	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	> 10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
936G:												
Fayette------	0-10	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
Hickory------	0-10	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	0-5	95-100	90-100	90-100	75-95	20-35	3-15
	10-50	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-1	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	50-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-1	0-5	85-100	75-95	70-95	60-80	20-40	5-20
943D3:												
Seaton-------	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	20-35	5-15
	7-50	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	90-100	25-40	5-20
	50-60	Silt loam, silt.	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-20
Timula-------	0-23	Silt loam-----	ML	A-4	0	0	100	100	95-100	85-100	25-35	NP-10
	23-60	Silt loam, silt.	ML	A-4	0	0	100	100	95-100	85-100	25-35	NP-10
957D2:												
Elco---------	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	7-25	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	95-100	85-100	25-45	10-30
	25-60	Silty clay loam, clay loam, silt loam, clay.	CL	A-7, A-6	0	0	100	90-100	85-95	75-95	25-45	10-30
Atlas--------	0-7	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	95-100	75-95	25-35	5-15
	7-60	Silty clay loam, clay, clay loam.	CH	A-7	0	0	100	95-100	95-100	75-95	50-70	30-45
957D3:												
Elco---------	0-7	Silty clay loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	30-45	15-30
	7-27	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	95-100	85-100	25-45	10-30
	27-60	Silty clay loam, clay loam, silt loam.	CL	A-7, A-6	0	0	100	90-100	85-95	75-95	25-45	10-30
Atlas--------	0-6	Clay loam-----	CH, CL	A-7	0	0	100	100	95-100	75-95	45-65	30-40
	6-60	Silty clay loam, clay, clay loam.	CH	A-7	0	0	100	95-100	95-100	75-95	50-70	30-45

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
3074---------- Radford	0-12	Silt loam-----	ML, CL	A-4, A-6	0	0	100	100	95-100	80-100	30-40	5-15
	12-32	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	95-100	80-100	25-35	5-15
	32-60	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	0	100	100	95-100	80-95	35-50	15-25
3107---------- Sawmill	0-9	Silty clay loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	30-50	15-30
	9-30	Silty clay loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	30-50	15-30
	30-45	Silty clay loam, clay loam, loam.	CL	A-6, A-7, A-4	0	0	100	100	85-100	70-95	25-50	8-25
	45-60	Silty clay loam, clay loam, silt loam.	CL	A-4, A-6, A-7	0	0	100	100	75-100	65-95	20-50	8-30
3107+---------- Sawmill	0-11	Silt loam-----	CL	A-6	0	0	100	100	80-100	75-95	25-40	10-20
	11-36	Silty clay loam.	CL	A-6, A-7	0	0	100	100	95-100	85-100	30-50	15-30
	36-53	Silty clay loam, clay loam, loam.	CL	A-6, A-7, A-4	0	0	100	100	85-100	70-95	25-50	8-25
	53-60	Silty clay loam, clay loam, silt loam.	CL	A-4, A-6, A-7	0	0	100	100	75-100	65-95	20-50	8-30
3405---------- Zook	0-8	Silty clay loam.	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	8-55	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
	55-60	Silty clay loam, silty clay, silt loam.	CH, CL	A-7, A-6	0	0	100	100	95-100	95-100	35-80	10-50
3415---------- Orion	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	80-100	25-35	4-12
	9-36	Stratified silt loam to very fine sand.	CL, CL-ML	A-4	0	0	100	100	90-100	70-80	20-30	4-10
	36-60	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	0	100	100	85-100	85-100	20-40	4-18
3451---------- Lawson	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	85-100	20-40	5-20
	7-30	Silt loam, silty clay loam.	CL, CL-ML	A-4	0	0	100	100	90-100	85-100	20-30	5-10
	30-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	90-100	60-100	20-45	10-25

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
7D3	0-8	30-40	1.35-1.55	0.06-0.2	0.14-0.19	4.5-7.3	High	0.43	2	7	.5-1
Atlas	8-45	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High	0.32			
	45-60	20-30	1.35-1.60	0.06-0.2	0.07-0.18	6.1-7.8	Moderate	0.32			
8D2	0-6	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low	0.37	5	6	1-2
Hickory	6-51	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate	0.28			
	51-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low	0.28			
8D3	0-6	27-35	1.40-1.65	0.6-2.0	0.17-0.19	4.5-7.3	Moderate	0.37	4	6	.5-1
Hickory	6-44	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate	0.28			
	44-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low	0.28			
8F	0-12	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low	0.37	5	6	1-2
Hickory	12-55	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate	0.28			
	55-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low	0.28			
8G	0-9	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low	0.37	5	6	1-2
Hickory	9-55	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate	0.28			
	55-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low	0.28			
17A	0-11	16-26	1.30-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	3	6	1-3
Keomah	11-55	35-42	1.30-1.45	0.06-0.6	0.18-0.20	4.5-5.5	High	0.37			
	55-60	24-38	1.40-1.55	0.2-0.6	0.18-0.20	5.1-7.3	Moderate	0.37			
19D2	0-5	20-27	1.20-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37	5	6	1-2
Sylvan	5-30	27-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.37			
	30-60	10-27	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	Low	0.37			
19D3	0-8	27-32	1.25-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Moderate	0.37	4	7	<1
Sylvan	8-28	27-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.37			
	28-60	10-27	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	Low	0.37			
36B	0-16	20-26	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.28	5	6	3-4
Tama	16-60	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43			
36B2	0-8	20-26	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.28	5	6	3-4
Tama	8-43	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43			
	43-60	20-30	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43			
36C2	0-6	20-26	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.28	5	6	3-4
Tama	6-39	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43			
	39-60	20-30	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43			
36C3	0-8	27-35	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32	5	7	1-3
Tama	8-20	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43			
	20-60	20-30	1.35-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43			
36D2	0-8	24-27	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32	5	6	1-3
Tama	8-51	27-32	1.25-1.30	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.32			
	51-60	27-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.43			
41A	0-18	24-27	1.28-1.32	0.6-2.0	0.22-0.24	5.1-7.3	Moderate	0.28	5	6	4-6
Muscatine	18-48	30-35	1.28-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43			
	48-60	22-30	1.35-1.40	0.6-2.0	0.18-0.20	6.6-7.8	Moderate	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
43A----------	0-11	20-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6	4-5
Ipava	11-60	35-43	1.25-1.50	0.2-0.6	0.11-0.20	5.6-7.8	High---------	0.43			
43B----------	0-17	20-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6	4-5
Ipava	17-58	35-43	1.25-1.50	0.2-0.6	0.11-0.20	5.6-7.8	High---------	0.43			
	58-60	20-30	1.30-1.55	0.2-0.6	0.20-0.22	6.1-8.4	Moderate-----	0.43			
45----------	0-8	20-27	1.25-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	3	6	3-4
Denny	8-17	15-22	1.25-1.45	0.2-0.6	0.18-0.20	5.6-6.5	Low----------	0.37			
	17-45	35-45	1.20-1.40	0.06-0.2	0.11-0.22	5.6-6.5	High---------	0.37			
	45-60	25-35	1.40-1.60	0.2-0.6	0.20-0.22	5.6-7.8	Moderate-----	0.37			
61A----------	0-8	20-26	1.35-1.55	0.6-2.0	0.22-0.25	5.6-7.3	Low----------	0.32	5	6	2-4
Atterberry	8-16	15-26	1.40-1.60	0.6-2.0	0.21-0.24	5.1-7.3	Low----------	0.32			
	16-50	25-35	1.40-1.60	0.6-2.0	0.14-0.24	5.1-7.3	Moderate-----	0.43			
	50-60	18-27	1.40-1.65	0.6-2.0	0.14-0.24	5.6-7.8	Low----------	0.43			
67----------	0-21	27-35	1.05-1.25	0.6-2.0	0.21-0.24	7.4-8.4	Moderate-----	0.28	5	4L	5-6
Harpster	21-35	27-35	1.20-1.50	0.6-2.0	0.18-0.22	7.4-8.4	Moderate-----	0.28			
	35-44	22-35	1.25-1.55	0.6-2.0	0.17-0.22	7.4-8.4	Moderate-----	0.28			
	44-60	15-30	1.40-1.60	0.6-2.0	0.11-0.22	7.4-8.4	Low----------	0.28			
68----------	0-23	27-35	1.15-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7	5-6
Sable	23-47	27-35	1.20-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28			
	47-60	24-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.28			
68+----------	0-14	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	6	2-4
Sable	14-56	27-35	1.20-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.28			
	56-60	24-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.28			
81A----------	0-7	18-27	1.20-1.45	0.6-2.0	0.20-0.24	5.6-7.8	Low----------	0.32	5	6	3-4
Littleton	7-55	22-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.32			
	55-60	18-27	1.20-1.40	0.6-2.0	0.20-0.22	5.6-7.8	Low----------	0.43			
119D2----------	0-11	20-27	1.20-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	1-3
Elco	11-34	23-35	1.25-1.45	0.6-2.0	0.18-0.21	5.1-7.8	Moderate-----	0.37			
	34-60	25-45	1.45-1.70	0.06-0.6	0.14-0.20	5.1-7.8	High---------	0.37			
119E2----------	0-9	20-27	1.20-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	1-3
Elco	9-26	23-35	1.25-1.45	0.6-2.0	0.18-0.21	5.1-7.8	Moderate-----	0.37			
	26-60	25-45	1.45-1.70	0.06-0.6	0.14-0.20	5.1-7.8	High---------	0.37			
250D2----------	0-7	20-27	1.30-1.50	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.32	5	6	3-4
Velma	7-45	25-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.32			
	45-60	20-30	1.50-1.70	0.6-2.0	0.06-0.09	7.4-8.4	Low----------	0.32			
257A----------	0-8	20-27	1.30-1.50	0.6-2.0	0.22-0.25	5.1-7.3	Moderate-----	0.37	5	6	2-3
Clarksdale	8-16	15-27	1.25-1.50	0.2-0.6	0.20-0.22	5.1-6.5	Low----------	0.37			
	16-44	35-45	1.30-1.50	0.2-0.6	0.11-0.20	5.1-7.3	High---------	0.37			
	44-60	20-30	1.40-1.60	0.2-0.6	0.20-0.22	6.1-8.4	Moderate-----	0.37			
259C2----------	0-8	20-27	1.25-1.45	0.6-2.0	0.23-0.25	5.6-7.3	Low----------	0.28	5	6	3-4
Assumption	8-32	25-35	1.20-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Moderate-----	0.43			
	32-60	30-45	1.45-1.65	0.06-0.6	0.14-0.20	5.1-7.3	High---------	0.43			
259D2----------	0-8	20-27	1.25-1.45	0.6-2.0	0.23-0.25	5.6-7.3	Low----------	0.28	5	6	3-4
Assumption	8-27	25-35	1.20-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Moderate-----	0.43			
	27-60	30-45	1.45-1.65	0.06-0.6	0.14-0.20	5.1-7.3	High---------	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
268B	0-16	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.32	5	6	2-3
Mt. Carroll	16-47	15-22	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.43			
	47-60	18-27	1.15-1.30	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.43			
274C2	0-9	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	5	1-3
Seaton	9-56	18-27	1.15-1.30	0.6-2.0	0.20-0.22	4.5-7.3	Low	0.37			
	56-60	15-25	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low	0.37			
274D	0-8	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	5	1-3
Seaton	8-55	18-27	1.15-1.30	0.6-2.0	0.20-0.22	4.5-7.3	Low	0.37			
	55-60	15-25	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low	0.37			
275A	0-19	15-25	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.28	5	6	2-4
Joy	19-54	18-27	1.15-1.25	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.43			
	54-60	12-23	1.15-1.30	0.6-2.0	0.20-0.22	6.1-8.4	Low	0.43			
277B	0-16	18-27	1.10-1.20	0.6-2.0	0.22-0.24	5.1-8.4	Low	0.32	5	6	3-5
Port Byron	16-50	18-25	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.43			
	50-60	15-27	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low	0.43			
277C2	0-9	18-27	1.10-1.20	0.6-2.0	0.22-0.24	5.1-8.4	Low	0.32	5	6	3-5
Port Byron	9-60	18-25	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.43			
278A	0-7	20-27	1.25-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	6	1-3
Stronghurst	7-17	20-27	1.30-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.37			
	17-48	27-35	1.30-1.55	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37			
	48-60	20-27	1.35-1.60	0.6-2.0	0.20-0.22	5.6-7.8	Low	0.37			
279B	0-9	15-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	6	1-3
Rozetta	9-13	12-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37			
	13-60	27-35	1.35-1.55	0.6-2.0	0.18-0.22	4.5-6.0	Moderate	0.37			
279C2	0-7	15-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	6	1-3
Rozetta	7-50	27-35	1.35-1.55	0.6-2.0	0.18-0.22	4.5-6.0	Moderate	0.37			
	50-60	20-27	1.40-1.60	0.6-2.0	0.20-0.22	5.6-7.8	Low	0.37			
279C3	0-7	27-35	1.30-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Moderate	0.43	4	7	<1
Rozetta	7-30	27-35	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.43			
	30-60	15-27	1.40-1.60	0.6-2.0	0.20-0.22	5.6-7.8	Low	0.43			
280B	0-11	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.32	5	6	2-3
Fayette	11-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.43			
280C2	0-7	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	5	6	1-2
Fayette	7-50	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43			
	50-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43			
280D2	0-9	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	5	6	1-2
Fayette	9-38	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43			
	38-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43			
280D3	0-8	27-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43	4	7	.5-2
Fayette	8-36	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43			
	36-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate	0.43			
280E2	0-12	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	5	6	1-2
Fayette	12-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate	0.43			
386B	0-13	15-25	1.25-1.30	2.0-6.0	0.21-0.23	5.1-7.3	Low	0.32	5	6	2-3
Downs	13-48	26-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.43			
	48-60	18-27	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
386C2----------	0-6	15-25	1.25-1.30	2.0-6.0	0.21-0.23	5.1-7.3	Low----------	0.32	5	6	2-3
Downs	6-32	26-35	1.30-1.35	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	32-60	18-27	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43			
430B----------	0-17	12-24	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.32	5	5	2-4
Raddle	17-50	18-24	1.20-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43			
	50-60	18-24	1.25-1.45	0.6-2.0	0.20-0.22	5.6-7.8	Low----------	0.43			
505G----------	0-4	15-27	1.10-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	2	6	1-3
Dunbarton	4-10	24-40	1.05-1.40	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.37			
	10-16	40-80	1.25-1.55	0.06-0.2	0.09-0.13	6.6-7.8	High---------	0.28			
	16	---	---	0.06-2.0	---	---	----------	----			
549D2----------	0-12	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	4	6	1-3
Marseilles	12-21	24-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.37			
	21-32	25-42	1.35-1.60	0.06-0.2	0.09-0.20	4.5-6.5	Moderate-----	0.37			
	32-60	---	---	0.01-0.2	---	---	----------	----			
549F----------	0-9	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	4	6	1-3
Marseilles	9-15	24-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.37			
	15-28	25-42	1.35-1.60	0.06-0.2	0.09-0.20	4.5-6.5	Moderate-----	0.37			
	28-60	---	---	0.01-0.2	---	---	----------	----			
549G----------	0-9	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	4	6	1-3
Marseilles	9-13	24-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.37			
	13-28	25-42	1.35-1.60	0.06-0.2	0.09-0.20	4.5-6.5	Moderate-----	0.37			
	28-60	---	---	0.01-0.2	---	---	----------	----			
567D3----------	0-8	27-35	1.20-1.40	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.32	4	7	1-3
Elkhart	8-31	25-35	1.25-1.45	0.6-2.0	0.18-0.20	5.6-8.4	Moderate-----	0.43			
	31-60	20-27	1.35-1.55	0.6-2.0	0.20-0.22	7.4-8.4	Low----------	0.43			
802B----------	0-60	18-35	1.45-1.65	0.06-2.0	0.12-0.18	---	Moderate-----	0.32	5	6	---
Orthents	60-80	---	---	0.06-2.0	---	---	----------	----			
864. Pits											
895E:											
Fayette---------	0-14	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6	2-3
	14-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43			
Westville-------	0-5	18-27	1.20-1.40	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.37	5	5	1-3
	5-54	25-35	1.35-1.55	0.6-2.0	0.15-0.19	5.1-7.3	Moderate-----	0.37			
	54-60	15-22	1.40-1.70	0.6-2.0	0.07-0.15	6.6-8.4	Low----------	0.24			
936D2:											
Fayette---------	0-8	25-27	1.35-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37	5	6	1-2
	8-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43			
Hickory---------	0-12	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37	5	6	1-2
	12-51	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate-----	0.28			
	51-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low----------	0.28			
936G:											
Fayette---------	0-10	15-27	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.32	5	6	2-3
	10-60	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43			
Hickory---------	0-10	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37	5	6	1-2
	10-50	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.28			
	50-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low----------	0.28			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
943D3:											
Seaton----------	0-7	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	7-50	18-27	1.15-1.30	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37			
	50-60	15-25	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low----------	0.37			
Timula----------	0-23	10-18	1.30-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	5	1-2
	23-60	10-18	1.40-1.60	0.6-2.0	0.18-0.20	7.4-8.4	Low----------	0.37			
957D2:											
Elco------------	0-7	20-27	1.20-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	1-3
	7-25	23-35	1.25-1.45	0.6-2.0	0.18-0.21	5.1-7.8	Moderate-----	0.37			
	25-60	23-35	1.40-1.60	0.2-0.6	0.16-0.20	5.1-7.8	Moderate-----	0.37			
Atlas------------	0-7	20-27	1.30-1.50	0.2-0.6	0.20-0.25	4.5-7.3	Moderate-----	0.43	3	6	1-3
	7-60	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High---------	0.32			
957D3:											
Elco------------	0-7	25-33	1.20-1.35	0.6-2.0	0.18-0.21	5.6-7.3	Moderate-----	0.37	4	7	.5-1
	7-27	23-35	1.25-1.45	0.6-2.0	0.18-0.21	5.1-7.8	Moderate-----	0.37			
	27-60	23-35	1.40-1.60	0.2-0.6	0.16-0.20	5.1-7.8	Moderate-----	0.37			
Atlas------------	0-6	30-40	1.35-1.55	0.06-0.2	0.11-0.16	4.5-7.3	High---------	0.32	2	6	.5-2
	6-60	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High---------	0.32			
3074-------------	0-12	18-27	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.28	5	6	2-4
Radford	12-32	18-27	1.40-1.60	0.6-2.0	0.20-0.22	6.1-7.8	Low----------	0.28			
	32-60	24-35	1.35-1.55	0.6-2.0	0.18-0.20	6.6-7.8	Moderate-----	0.28			
3107-------------	0-9	27-35	1.20-1.40	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28	5	7	4-5
Sawmill	9-30	27-35	1.20-1.40	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28			
	30-45	25-35	1.30-1.45	0.6-2.0	0.17-0.20	6.1-7.8	Moderate-----	0.28			
	45-60	18-35	1.35-1.50	0.6-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.28			
3107+------------	0-11	18-27	1.25-1.40	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.28	5	6	4-5
Sawmill	11-36	27-35	1.20-1.40	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28			
	36-53	25-35	1.30-1.45	0.6-2.0	0.17-0.20	6.1-7.8	Moderate-----	0.28			
	53-60	18-35	1.35-1.50	0.6-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.28			
3405-------------	0-8	35-40	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High---------	0.37	5	7	5-7
Zook	8-55	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High---------	0.28			
	55-60	20-45	1.30-1.45	0.06-0.6	0.11-0.22	5.6-7.8	High---------	0.28			
3415-------------	0-9	10-18	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.8	Low----------	0.37	5	5	1-3
Orion	9-36	10-18	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.8	Low----------	0.37			
	36-60	10-30	1.25-1.45	0.6-2.0	0.18-0.22	5.6-7.8	Low----------	0.37			
3451-------------	0-7	10-27	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.28	5	5	3-7
Lawson	7-30	10-30	1.20-1.55	0.6-2.0	0.18-0.22	6.1-7.8	Low----------	0.28			
	30-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43			

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "frequent," "brief," "apparent," and "perched" are explained in the
symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern
were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Ris
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Unco st
					Ft			In			
7D3---------- Atlas	D	None--------	---	---	1.0-2.0	Perched	Apr-Jun	>60	---	High-----	High
8D2, 8D3, 8F, 8G-- Hickory	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Mode
17A---------- Keomah	C	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High
19D2, 19D3-------- Sylvan	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Mode
36B, 36B2, 36C2, 36C3---------- Tama	B	None--------	---	---	4.0-6.0	Apparent	Nov-Jun	>60	---	High-----	Mode
36D2---------- Tama	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Mode
41A---------- Muscatine	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High
43A, 43B---------- Ipava	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High
45---------- Denny	D	None--------	---	---	+1-2.0	Apparent	Mar-Jun	>60	---	High-----	High
61A---------- Atterberry	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High
67---------- Harpster	B/D	None--------	---	---	+.5-2.0	Apparent	Feb-Jun	>60	---	High-----	High
68, 68+---------- Sable	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High
81A---------- Littleton	B	None--------	---	---	1.0-3.0	Apparent	Apr-Jun	>60	---	High-----	High
119D2, 119E2------ Elco	B	None--------	---	---	2.5-4.5	Perched	Mar-May	>60	---	High-----	High

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Ris
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Unco st
					Ft			In			
250D2---------- Velma	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High
257A---------- Clarksdale	C	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High
259C2, 259D2------ Assumption	B	None--------	---	---	2.5-4.5	Perched	Feb-May	>60	---	High-----	High
268B---------- Mt. Carroll	B	None--------	---	---	4.0-6.0	Apparent	Apr-Jun	>60	---	High-----	Mode
274C2, 274D------- Seaton	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low-
275A---------- Joy	B	None--------	---	---	2.0-4.0	Apparent	Apr-Jun	>60	---	High-----	High
277B, 277C2------- Port Byron	B	None--------	---	---	4.0-6.0	Apparent	Mar-May	>60	---	High-----	Low-
278A---------- Stronghurst	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High
279B, 279C2, 279C3---------- Rozetta	B	None--------	---	---	4.0-6.0	Apparent	Mar-Jun	>60	---	High-----	Mode
280B, 280C2, 280D2, 280D3, 280E2---------- Fayette	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Mode
386B, 386C2------- Downs	B	None--------	---	---	4.0-6.0	Apparent	Mar-Jun	>60	---	High-----	Mode
430B---------- Raddle	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Mode
505G---------- Dunbarton	D	None--------	---	---	>6.0	---	---	12-20	Hard	Moderate	Mode
549D2, 549F, 549G- Marseilles	B	None--------	---	---	1.5-3.5	Perched	Feb-Jun	20-40	Soft	High-----	High
567D3---------- Elkhart	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Mode

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Ris
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Unco st
					Ft			In			
802B---------- Orthents	---	None--------	---	---	>6.0	---	---	>60	---	---	-
864. Pits											
895E:											
Fayette----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Mode
Westville--------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Mode
936D2, 936G:											
Fayette----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Mode
Hickory----------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Mode
943D3:											
Seaton-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low-
Timula-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low-
957D2, 957D3:											
Elco-------------	B	None--------	---	---	2.5-4.5	Perched	Mar-May	>60	---	High-----	High
Atlas------------	D	None--------	---	---	1.0-2.0	Perched	Apr-Jun	>60	---	High-----	High
3074---------- Radford	B	Frequent----	Brief-----	Mar-Jun	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High
3107, 3107+------- Sawmill	B/D	Frequent----	Brief-----	Mar-Jun	0-2.0	Apparent	Mar-Jun	>60	---	High-----	High
3405---------- Zook	C/D	Frequent----	Brief-----	Feb-Nov	0-3.0	Apparent	Nov-May	>60	---	High-----	High
3415---------- Orion	C	Frequent----	Brief-----	Mar-Nov	1.0-3.0	Apparent	Nov-May	>60	---	High-----	High
3451---------- Lawson	C	Frequent----	Brief-----	Mar-Nov	1.0-3.0	Apparent	Nov-May	>60	---	High-----	Mode

TABLE 18.--ENGINEERING INDEX TEST DATA

(MAX means maximum dry density; OPT, optimum moisture; LL, liquid limit; PI, plasticity index; and UN, Unified)

Soil name	Sample number	Horizon	Depth	Moisture density		Percentage passing sieve--				LL	PI	Classification	
				MAX	OPT	No. 4	No. 10	No. 40	No. 200			AASHTO	UN
			In	Lb/ cu ft	Pct					Pct			
Atterberry silt loam	87IL-187-3												
	-1	Ap	0-8	98.5	20.4	100.0	99.7	98.8	96.7	39.1	12.8	A-6	ML
	-6	Btg3	33-43	105.4	20.0	---	100.0	98.8	98.2	46.3	26.9	A-7-6	CL
	-8	Cg	58-60	109.6	17.4	---	100.0	99.7	99.0	38.9	19.2	A-6	CL
Clarksdale silt loam	87IL-187-1												
	-1	Ap	0-7	97.0	22.4	---	100.0	98.5	96.6	40.3	13.4	A-7-6	ML
	-6	Btg2	23-32	107.4	18.0	---	100.0	99.9	99.3	42.6	23.5	A-7-6	CL
	-8	Cg	58-60	107.6	18.6	---	100.0	99.9	99.4	38.7	19.0	A-6	CL
Downs silt loam------	87IL-187-2												
	-1	Ap	0-6	99.3	19.3	---	100.0	99.3	97.1	34.6	9.3	A-4	ML
	-5	Bt2	29-36	102.6	20.6	---	100.0	99.8	99.0	42.7	20.5	A-7-6	CL
	-7	BC	53-60	103.3	21.2	---	100.0	99.6	98.8	39.7	19.6	A-6	CL
Joy silt loam--------	87IL-187-4												
	-2	A	7-14	102.3	20.6	---	100.0	99.7	99.3	37.4	13.9	A-6	CL
	-5	Btg	29-40	106.9	17.4	---	100.0	99.0	98.2	43.7	22.0	A-7-6	CL
	-7	Cg	48-60	110.9	16.3	---	100.0	99.8	99.4	32.5	11.9	A-6	CL
Sawmill silty clay loam----------	87IL-187-5												
	-1	Ap	0-10	101.2	19.1	100.0	99.8	99.3	97.2	40.7	18.4	A-7-6	CL
	-3	A2	20-30	105.5	19.6	100.0	99.5	97.1	94.6	45.1	26.1	A-7-6	CL
	-5	Bg1	36-53	108.1	18.7	---	100.0	98.4	97.0	43.5	17.9	A-7-6	CL

TABLE 19.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
*Assumption	Fine-silty, mixed, mesic Typic Argiudolls
Atlas	Fine, montmorillonitic, mesic, sloping Aeric Ochraqualfs
Atterberry	Fine-silty, mixed, mesic Udollic Ochraqualfs
Clarksdale	Fine, montmorillonitic, mesic Udollic Ochraqualfs
*Denny	Fine, montmorillonitic, mesic Mollic Albaqualfs
Downs	Fine-silty, mixed, mesic Mollic Hapludalfs
Dunbarton	Clayey, montmorillonitic, mesic Lithic Hapludalfs
Elco	Fine-silty, mixed, mesic Typic Hapludalfs
*Elkhart	Fine-silty, mixed, mesic Typic Argiudolls
Fayette	Fine-silty, mixed, mesic Typic Hapludalfs
Harpster	Fine-silty, mesic Typic Calciaquolls
Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
Ipava	Fine, montmorillonitic, mesic Aquic Argiudolls
Joy	Fine-silty, mixed, mesic Aquic Hapludolls
Keomah	Fine, montmorillonitic, mesic Aeric Ochraqualfs
Lawson	Fine-silty, mixed, mesic Cumulic Hapludolls
Littleton	Fine-silty, mixed, mesic Cumulic Hapludolls
Marseilles	Fine-silty, mixed, mesic Typic Hapludalfs
Mt. Carroll	Fine-silty, mixed, mesic Mollic Hapludalfs
Muscatine	Fine-silty, mixed, mesic Aquic Hapludolls
Orion	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Orthents	Orthents
*Port Byron	Fine-silty, mixed, mesic Typic Hapludolls
Raddle	Fine-silty, mixed, mesic Typic Hapludolls
Radford	Fine-silty, mixed, mesic Fluvaquentic Hapludolls
Rozetta	Fine-silty, mixed, mesic Typic Hapludalfs
Sable	Fine-silty, mixed, mesic Typic Haplaquolls
Sawmill	Fine-silty, mixed, mesic Cumulic Haplaquolls
Seaton	Fine-silty, mixed, mesic Typic Hapludalfs
Stronghurst	Fine-silty, mixed, mesic Aeric Ochraqualfs
Sylvan	Fine-silty, mixed, mesic Typic Hapludalfs
*Tama	Fine-silty, mixed, mesic Typic Argiudolls
Timula	Coarse-silty, mixed, mesic Typic Eutrochrepts
*Velma	Fine-loamy, mixed, mesic Typic Argiudolls
Westville	Fine-loamy, mixed, mesic Typic Hapludalfs
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

Nondiscrimination Statement

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for

program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

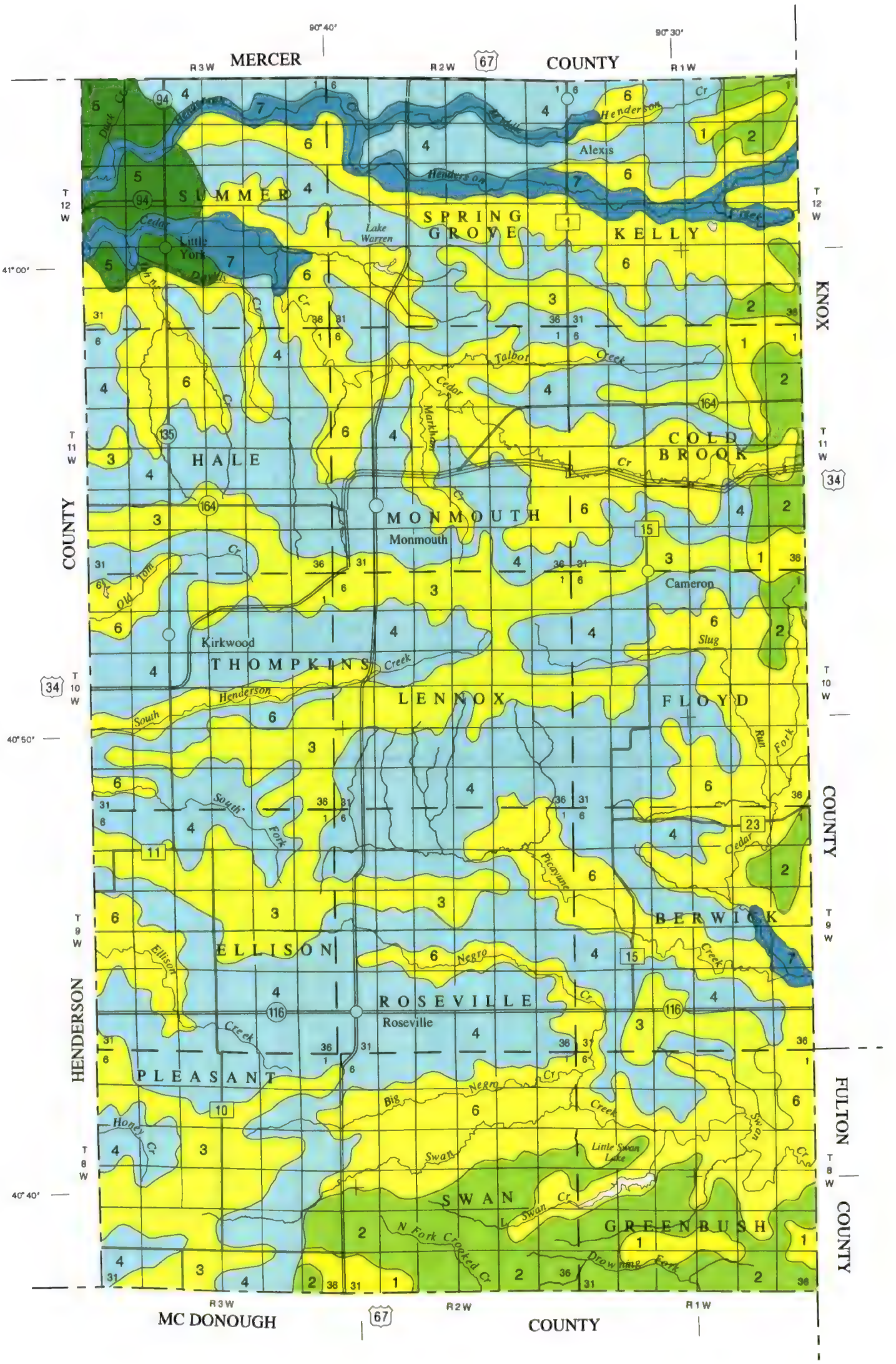
Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



N

SOIL LEGEND*

1	Ipava-Sable association
2	Ipava-Tama association
3	Sable-Muscatine association
4	Tama-Muscatine association
5	Port Byron-Joy-Seaton association
6	Rozetta-Hickory-Elco association
7	Radford-Sawmill-Lawson association

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1990

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

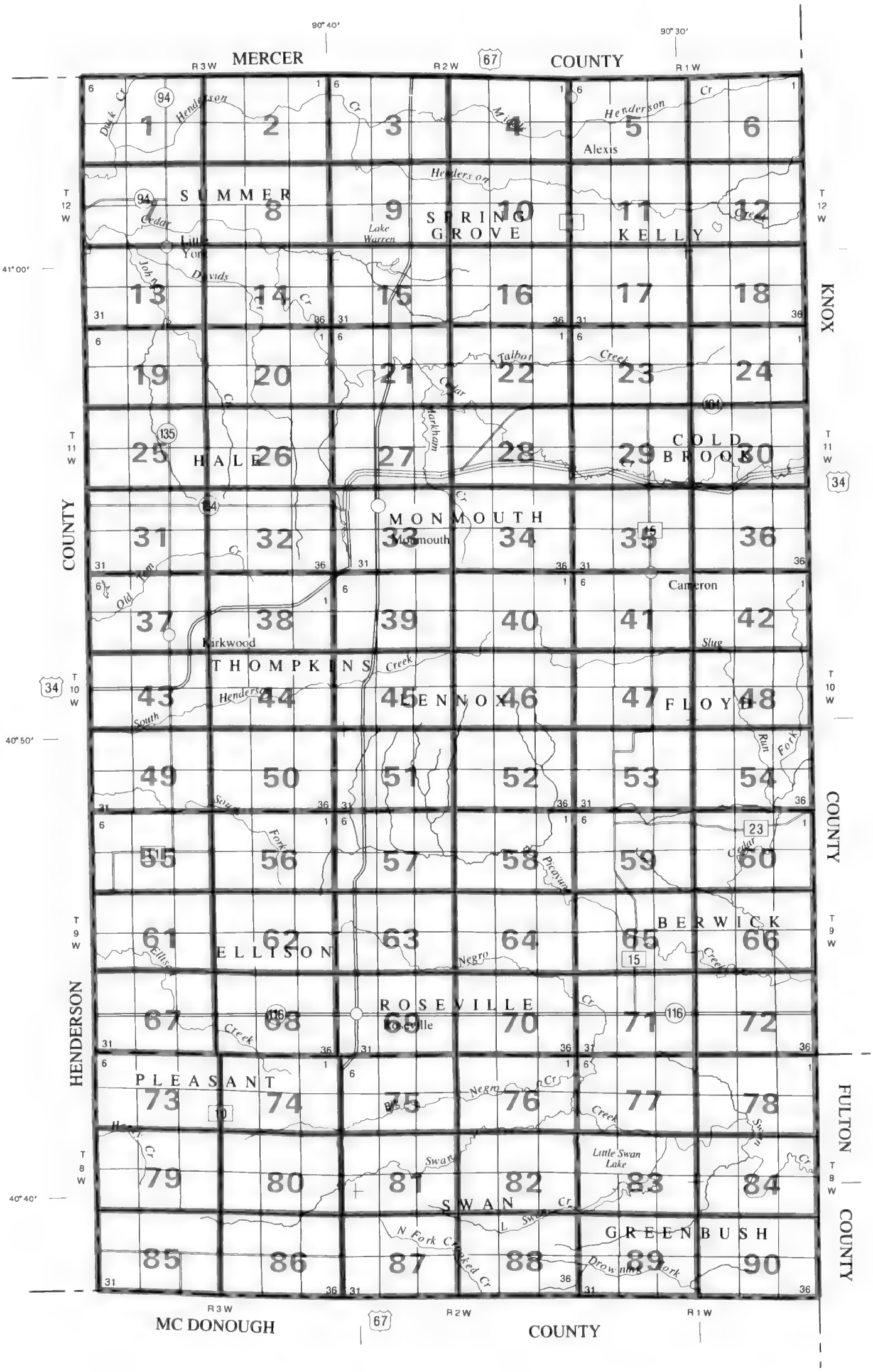
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
IN COOPERATION WITH
ILLINOIS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
WARREN COUNTY, ILLINOIS

Scale 1:190080

1 0 1 2 3 MILES

1 0 1 2 3 4 5 6 KILOMETERS



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
WARREN COUNTY, ILLINOIS

Scale 1:190080

1 0 1 2 3 MILES

1 0 1 2 3 4 5 6 KILOMETERS

SOIL LEGEND

Map symbols consist of numbers, or a combination of numbers and letters. The initial numbers represent the kind of soil. A capital letter following those numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded, and 3 that it is severely eroded.

SYMBOL	NAME
7D3	Atlas silty clay loam, 10 to 18 percent slopes, severely eroded
8D2	Hickory silt loam, 10 to 18 percent slopes, eroded
8D3	Hickory clay loam, 10 to 18 percent slopes, severely eroded
8F	Hickory silt loam, 18 to 30 percent slopes
8G	Hickory silt loam, 30 to 50 percent slopes
17A	Keomah silt loam, 0 to 2 percent slopes
19D2	Sylvan silt loam, 10 to 18 percent slopes, eroded
19D3	Sylvan silty clay loam, 10 to 18 percent slopes, severely eroded
36B	Tama silt loam, 2 to 5 percent slopes
36B2	Tama silt loam, 2 to 5 percent slopes, eroded
36C2	Tama silt loam, 5 to 10 percent slopes, eroded
36C3	Tama silty clay loam, 5 to 10 percent slopes, severely eroded
36D2	Tama silt loam, 10 to 15 percent slopes, eroded
41A	Muscatine silt loam, 0 to 2 percent slopes
43A	Ipava silt loam, 0 to 2 percent slopes
43B	Ipava silt loam, 2 to 4 percent slopes
45	Denny silt loam
61A	Atterberry silt loam, 0 to 2 percent slopes
67	Harpster silty clay loam
68	Sable silty clay loam
68+	Sable silt loam, overwash
81A	Littleton silt loam, 0 to 2 percent slopes
119D2	Elco silt loam, 10 to 15 percent slopes, eroded
119E2	Elco silt loam, 15 to 20 percent slopes, eroded
250D2	Velma silt loam, 10 to 18 percent slopes, eroded
257A	Clarksdale silt loam, 0 to 2 percent slopes
259C2	Assumption silt loam, 5 to 10 percent slopes, eroded
259D2	Assumption silt loam, 10 to 15 percent slopes, eroded
268B	Mt. Carroll silt loam, 2 to 5 percent slopes
274C2	Seaton silt loam, 5 to 10 percent slopes, eroded
274D	Seaton silt loam, 10 to 15 percent slopes
275A	Joy silt loam, 0 to 2 percent slopes
277B	Port Byron silt loam, 2 to 5 percent slopes
277C2	Port Byron silt loam, 5 to 10 percent slopes, eroded
278A	Stronghurst silt loam, 0 to 2 percent slopes
279B	Rozetta silt loam, 2 to 5 percent slopes
279C2	Rozetta silt loam, 5 to 10 percent slopes, eroded
279C3	Rozetta silty clay loam, 5 to 10 percent slopes, severely eroded
280B	Fayette silt loam, 2 to 5 percent slopes
280C2	Fayette silt loam, 5 to 10 percent slopes, eroded
280D2	Fayette silt loam, 10 to 15 percent slopes, eroded
280D3	Fayette silty clay loam, 10 to 15 percent slopes, severely eroded
280E2	Fayette silt loam, 15 to 20 percent slopes, eroded
386B	Downs silt loam, 2 to 5 percent slopes
386C2	Downs silt loam, 5 to 10 percent slopes, eroded
430B	Raddle silt loam, 2 to 5 percent slopes
505G	Dunbarton silt loam, 20 to 60 percent slopes
549D2	Marseilles silt loam, 10 to 18 percent slopes, eroded
549F	Marseilles silt loam, 18 to 30 percent slopes
549G	Marseilles silt loam, 30 to 60 percent slopes
567D3	Elkhart silty clay loam, 8 to 15 percent slopes, severely eroded
802B	Orthents, loamy, gently sloping
864	Pits, quarries
895E	Fayette-Westville complex, 12 to 20 percent slopes
936D2	Fayette-Hickory complex, 10 to 18 percent slopes, eroded
936G	Fayette-Hickory complex, 18 to 50 percent slopes
943D3	Seaton-Timula complex, 10 to 18 percent slopes, severely eroded
957D2	Elco-Atlas complex, 10 to 15 percent slopes, eroded
957D3	Elco-Atlas complex, 10 to 18 percent slopes, severely eroded
3074	Radford silt loam, frequently flooded
3107	Sawmill silty clay loam, frequently flooded
3107+	Sawmill silt loam, overwash
3405	Zook silty clay loam, frequently flooded
3415	Orion silt loam, frequently flooded
3451	Lawson silt loam, frequently flooded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County or parish
- Reservation (large airport)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery

STATE COORDINATE TICK — 1 890 000 FEET

LAND DIVISION CORNER (sections)

ROADS

- Divided (median shown if scale permits)
- Other roads

ROAD EMBLEM & DESIGNATIONS

- Federal — 34
- State — 94

RAILROAD

LEVEES

- Without road

DAMS

- Medium or Small

WATER FEATURES

DRAINAGE

- Perennial, single line
- Intermittent
- Drainage end
- Drainage ditch

LAKES, PONDS, AND RESERVOIRS

- Perennial

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 68 . 36B

ESCARPMENTS

- Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- SOIL SAMPLE — S

MISCELLANEOUS

- Rock outcrop (includes sandstone and shale)
- Sandy spot
- Severely eroded spot
- Calcareous spot
- Denny spot
- Paleosol spot
- Outwash spot

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

WARREN COUNTY, ILLINOIS NO. 1

MERCER COUNTY R. 3 W.

HENDERSON COUNTY

T. 12 N.

Duck Creek

HENDERSON CREEK

(Joins sheet 2)

(Joins sheet 7)

1 Mile

5 000 Feet

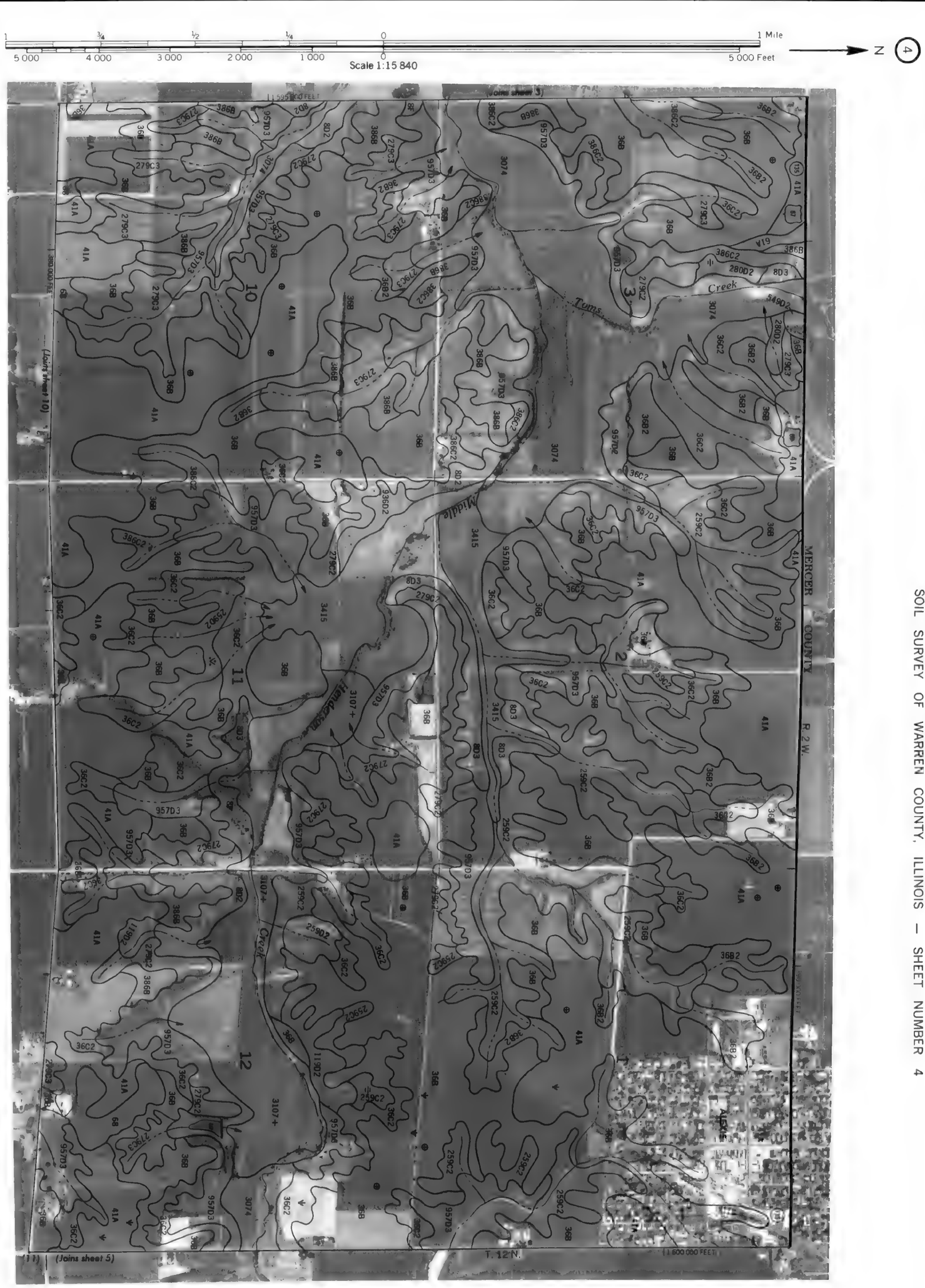
Scale 1:15 840

WARREN COUNTY, ILLINOIS NO. 2

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 3



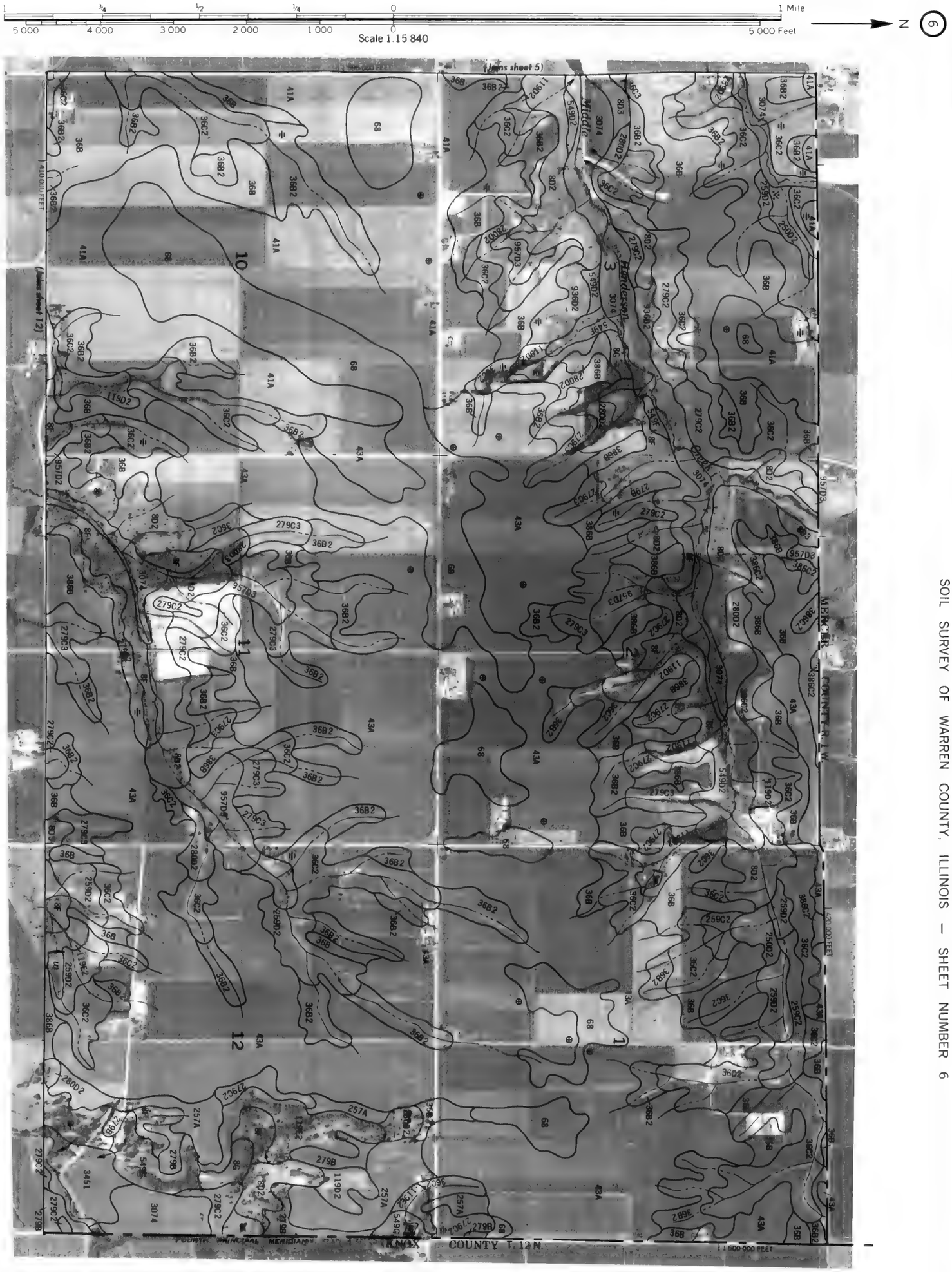
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 4

WARREN COUNTY, ILLINOIS NO. 4

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 5



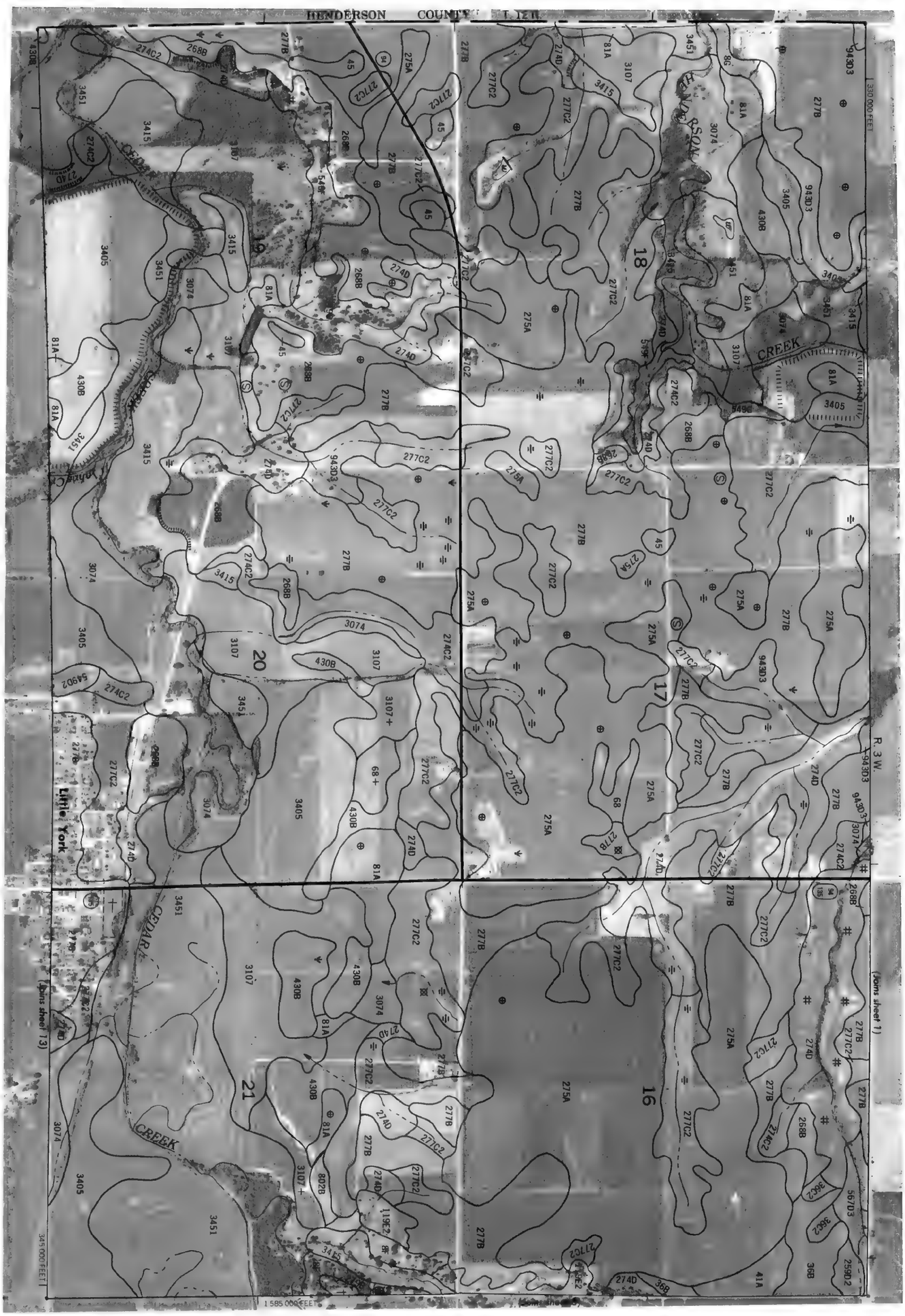
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 6

WARREN COUNTY, ILLINOIS NO. 6

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 7



1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 7

8

N

1 Mile 5 000 Feet

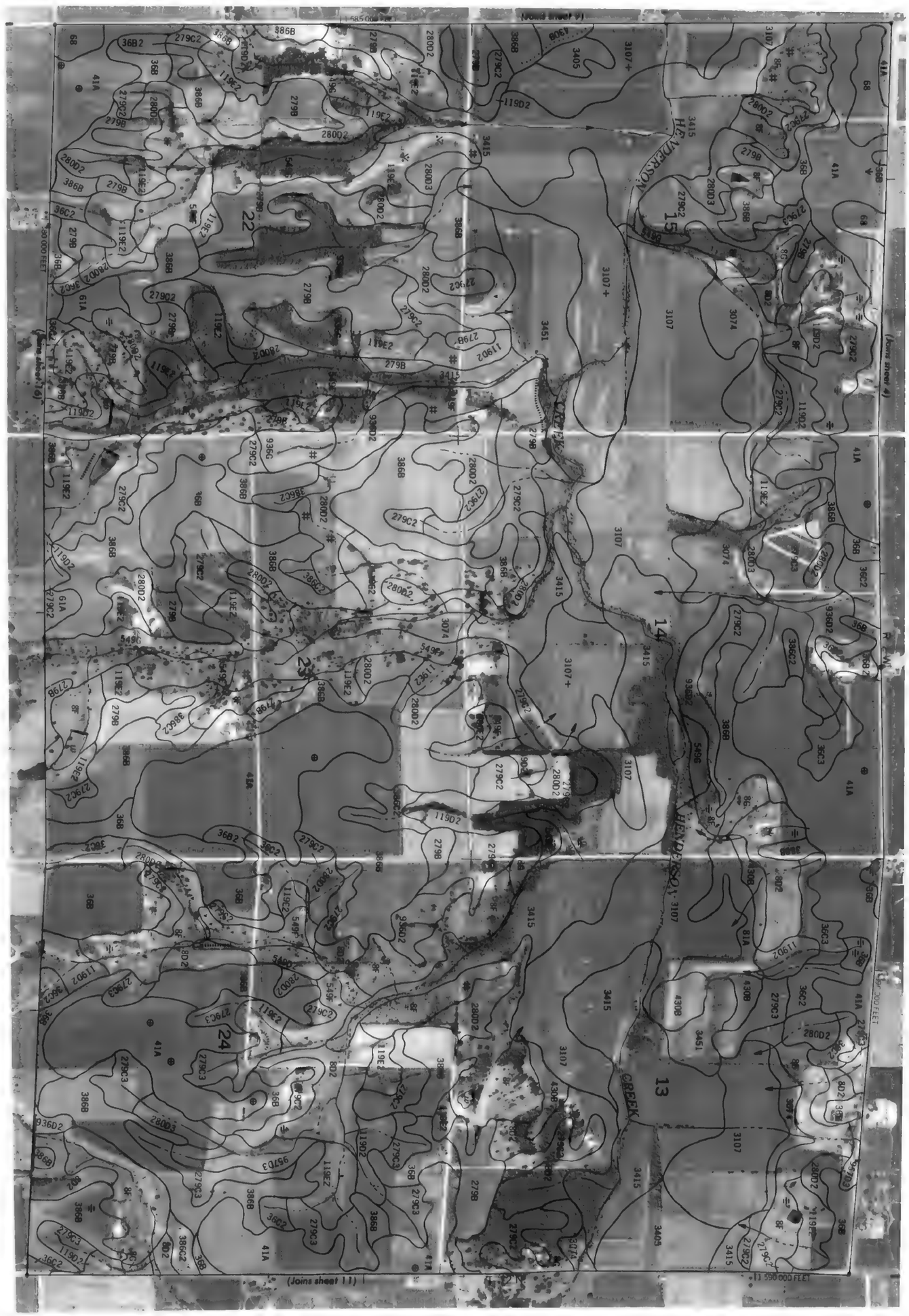
Scale 1:15 840

WARREN COUNTY, ILLINOIS NO. 8

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 9



WARREN COUNTY, ILLINOIS NO. 10

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

11

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 11

12

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

1 585 000 FEET

410 000 FEET

590 000 FEET

(Joins sheet 6)

(Joins sheet 11)

(Joins sheet 18)

(Joins sheet 7)

R. 1 W.

KNOX COUNTY

Henderson Creek

South Henderson Creek

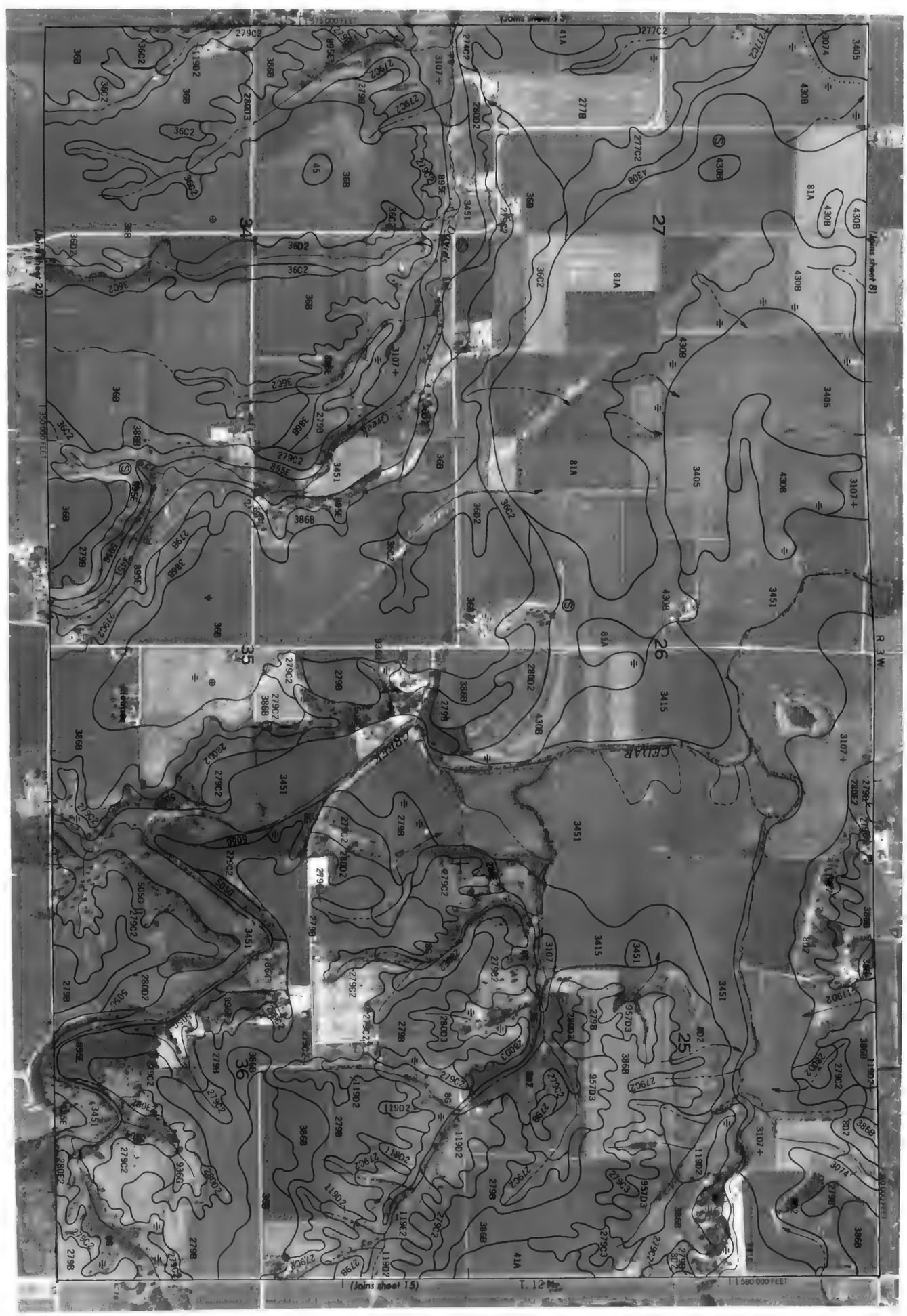
15 14 13 22 23 24

WARREN COUNTY, ILLINOIS NO. 12

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 13



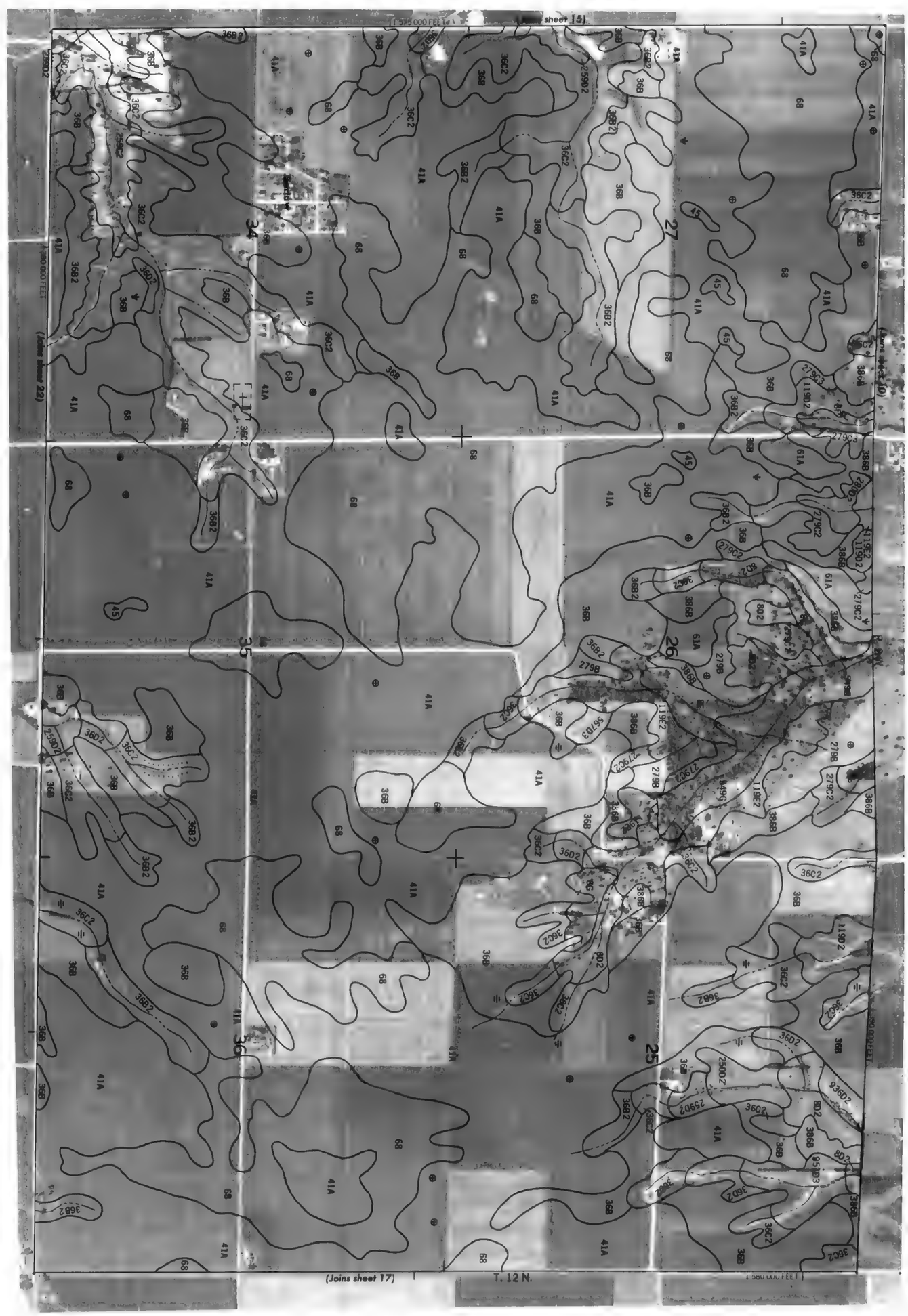
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 14

WARREN COUNTY, ILLINOIS NO. 14

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 15

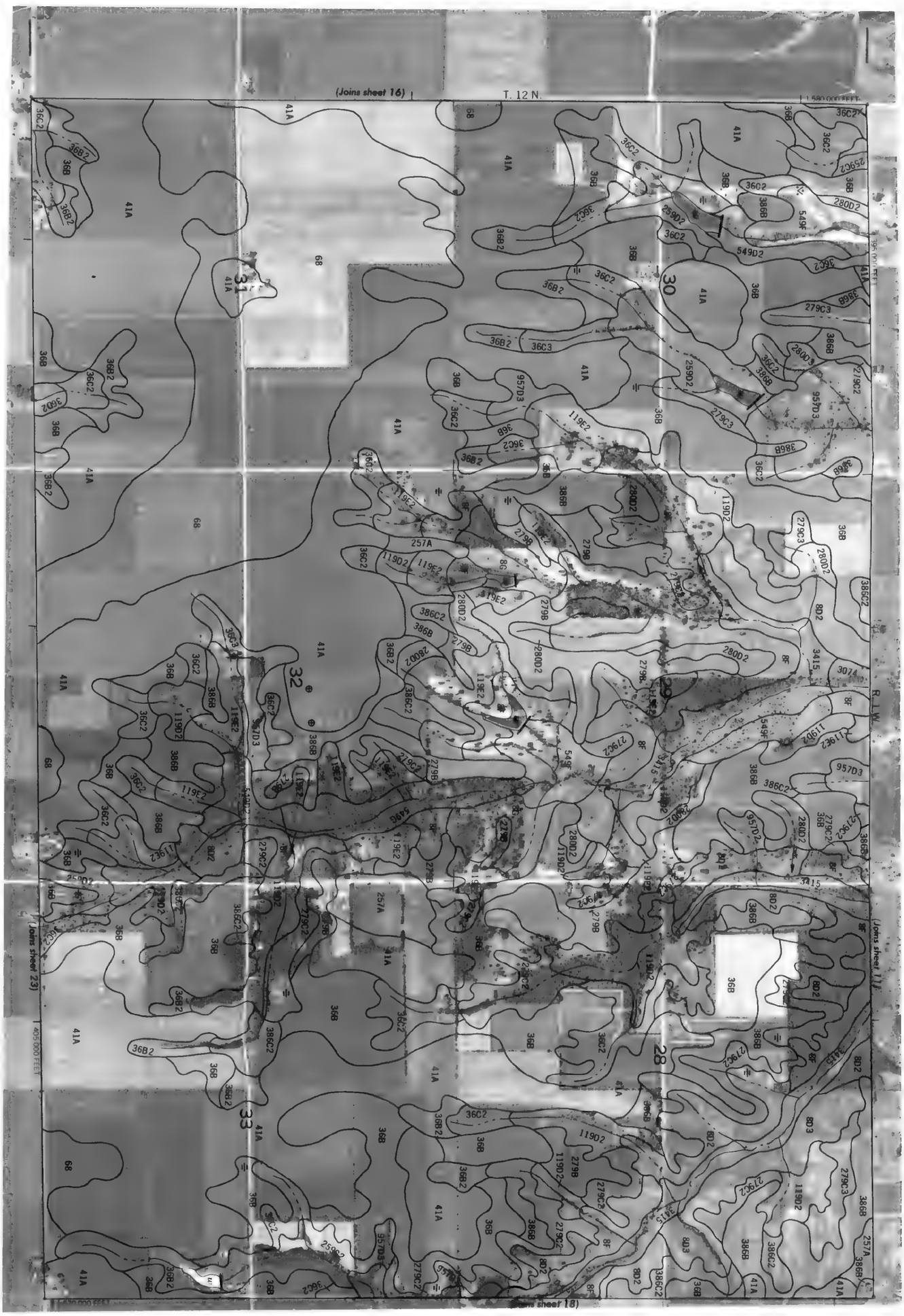


WARREN COUNTY, ILLINOIS NO. 16

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 17



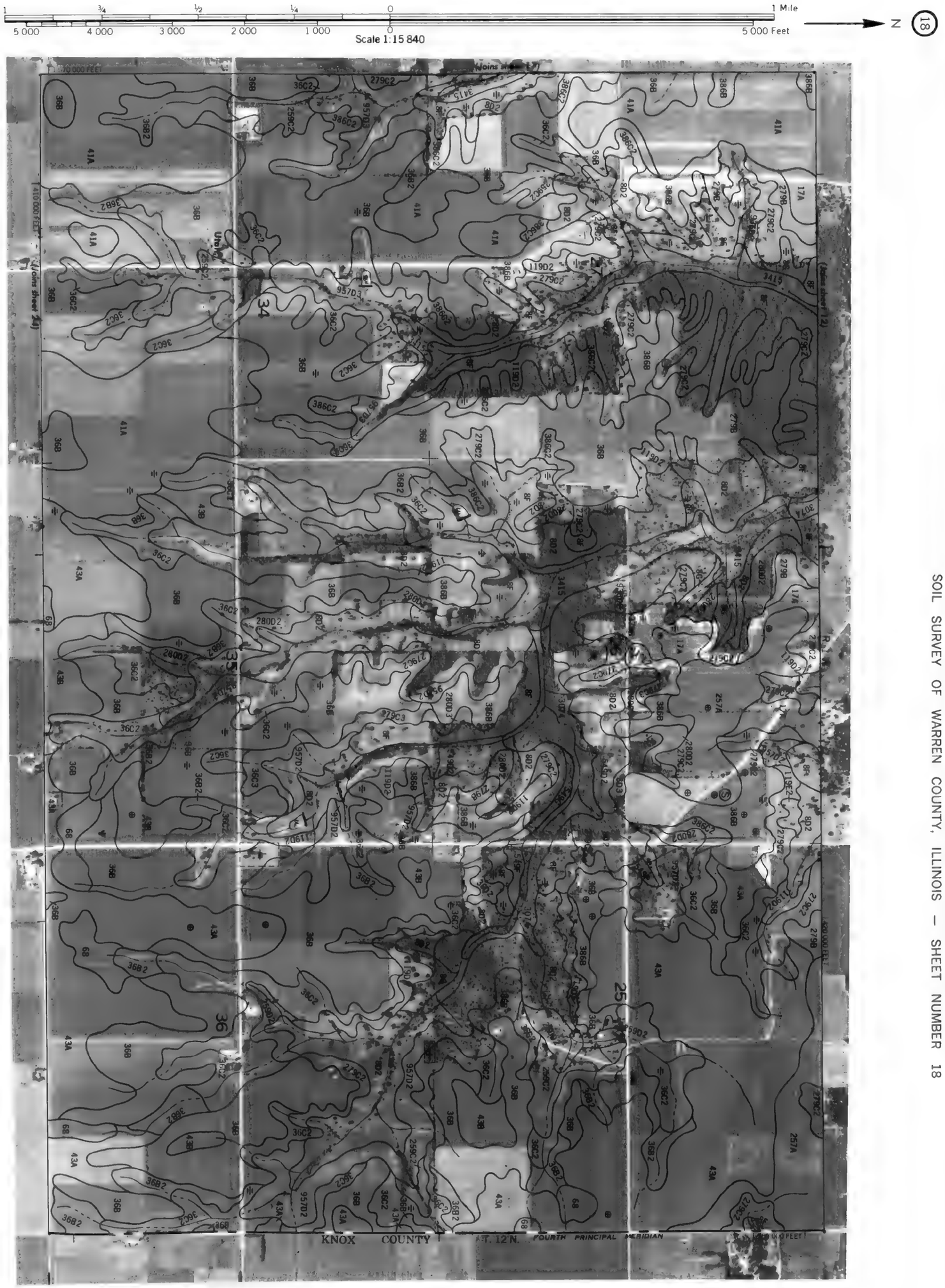
1 ¾ ½ ¼ 0 1 Mile

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 17



WARREN COUNTY, ILLINOIS NO. 18

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 19

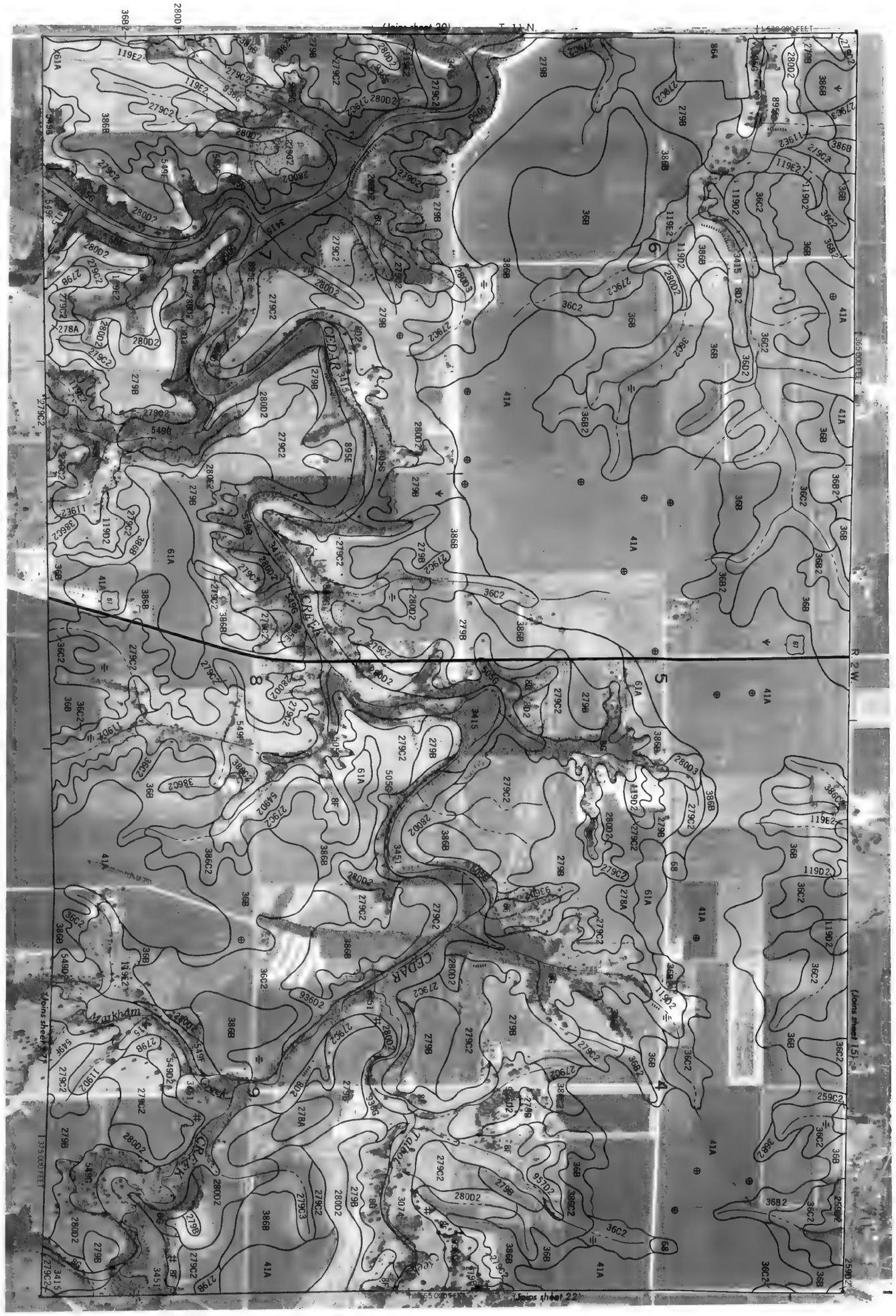
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 20

WARREN COUNTY, ILLINOIS NO. 20

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

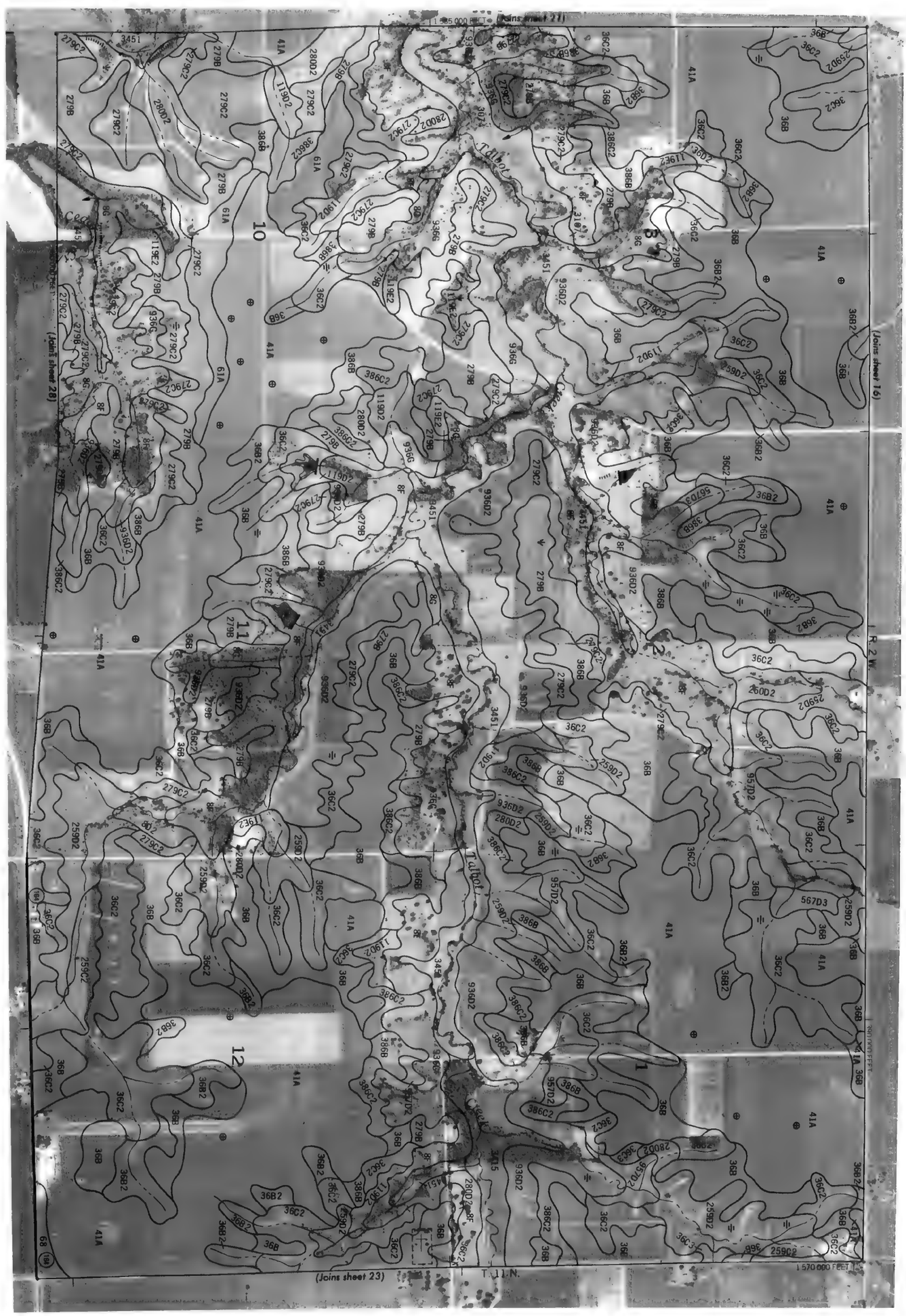
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 21



1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N



WARREN COUNTY, ILLINOIS NO. 22

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 23

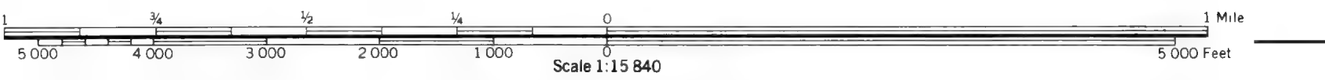
1 ¾ ½ ¼ 0 1 Mile

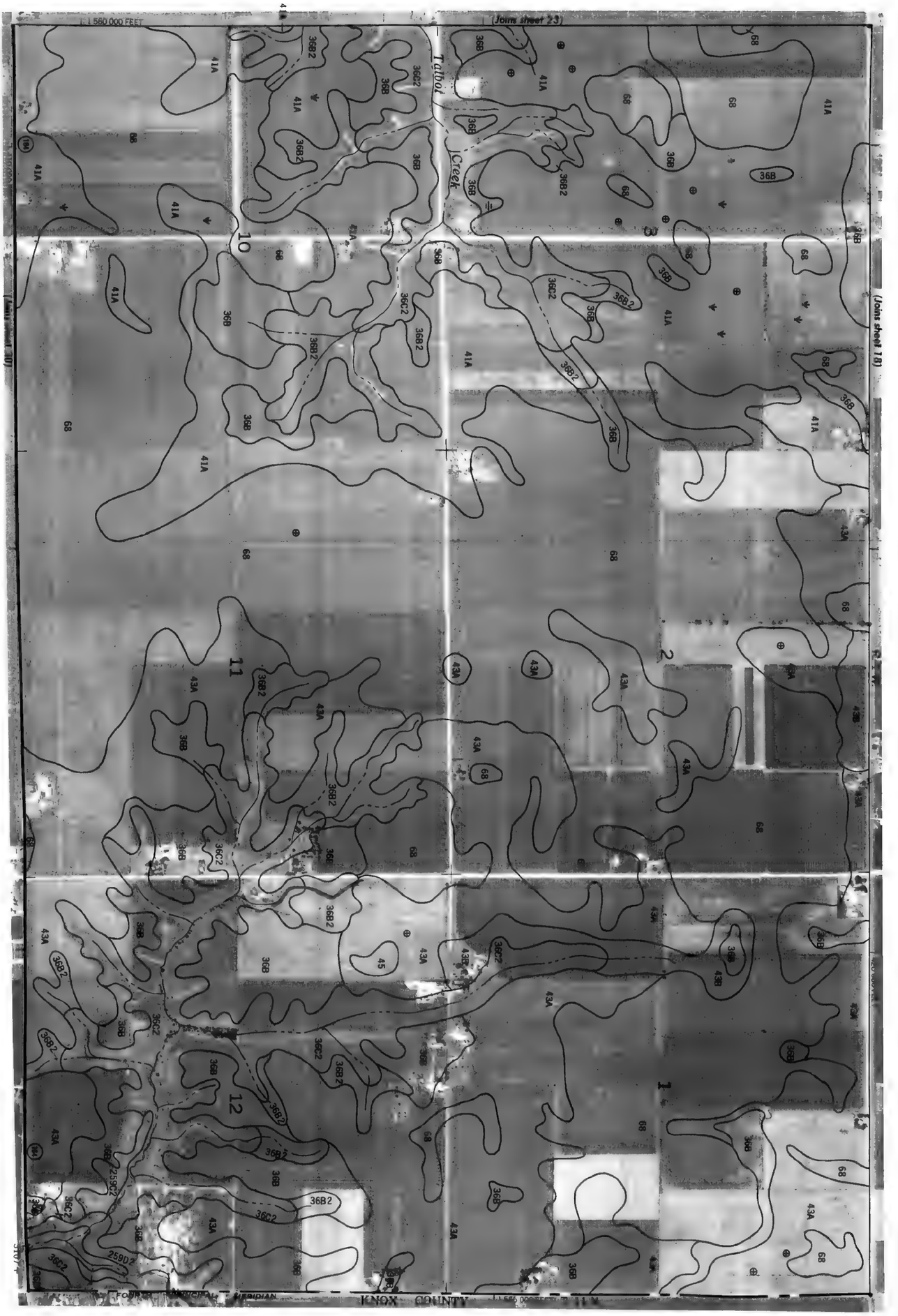
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 23



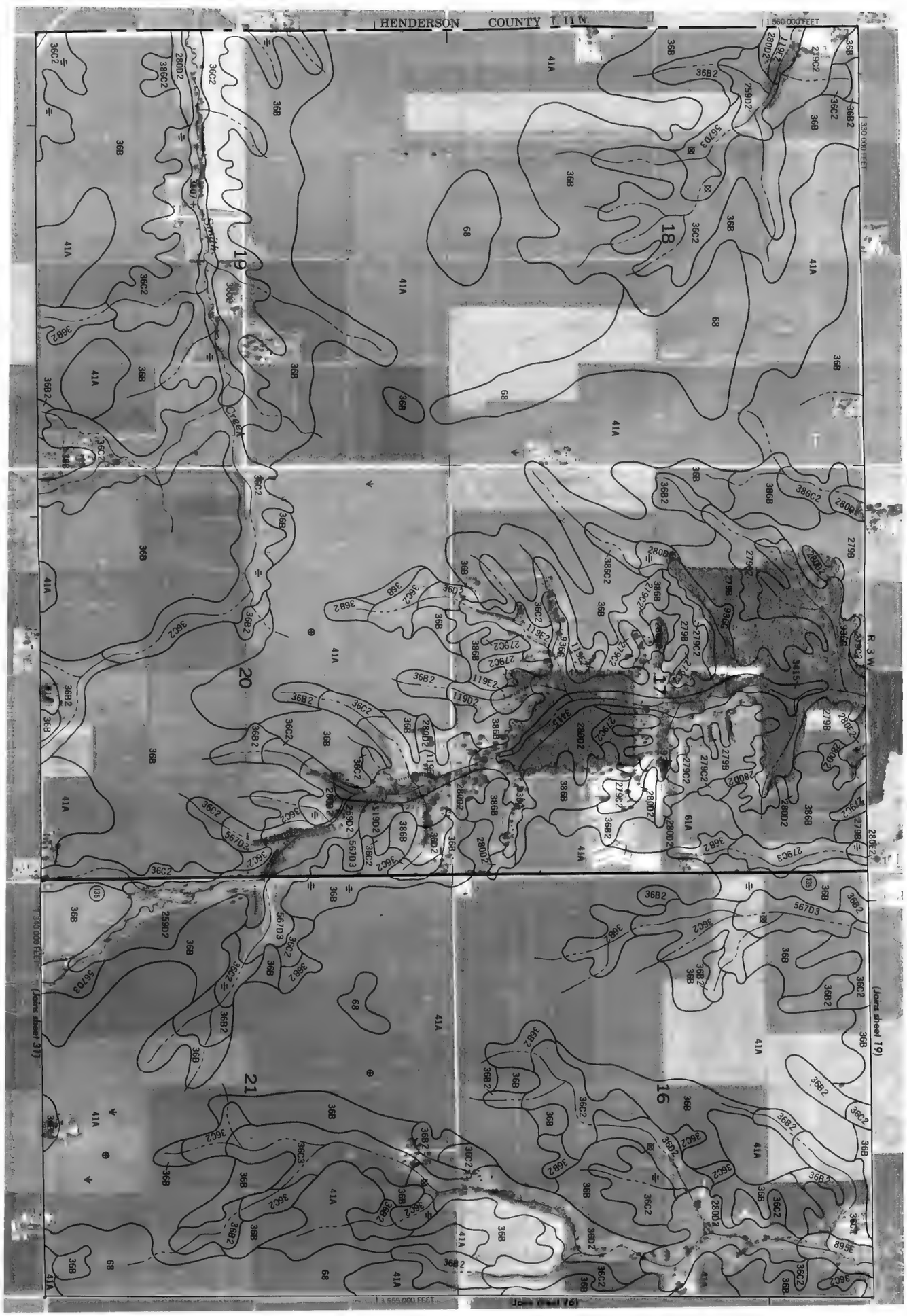


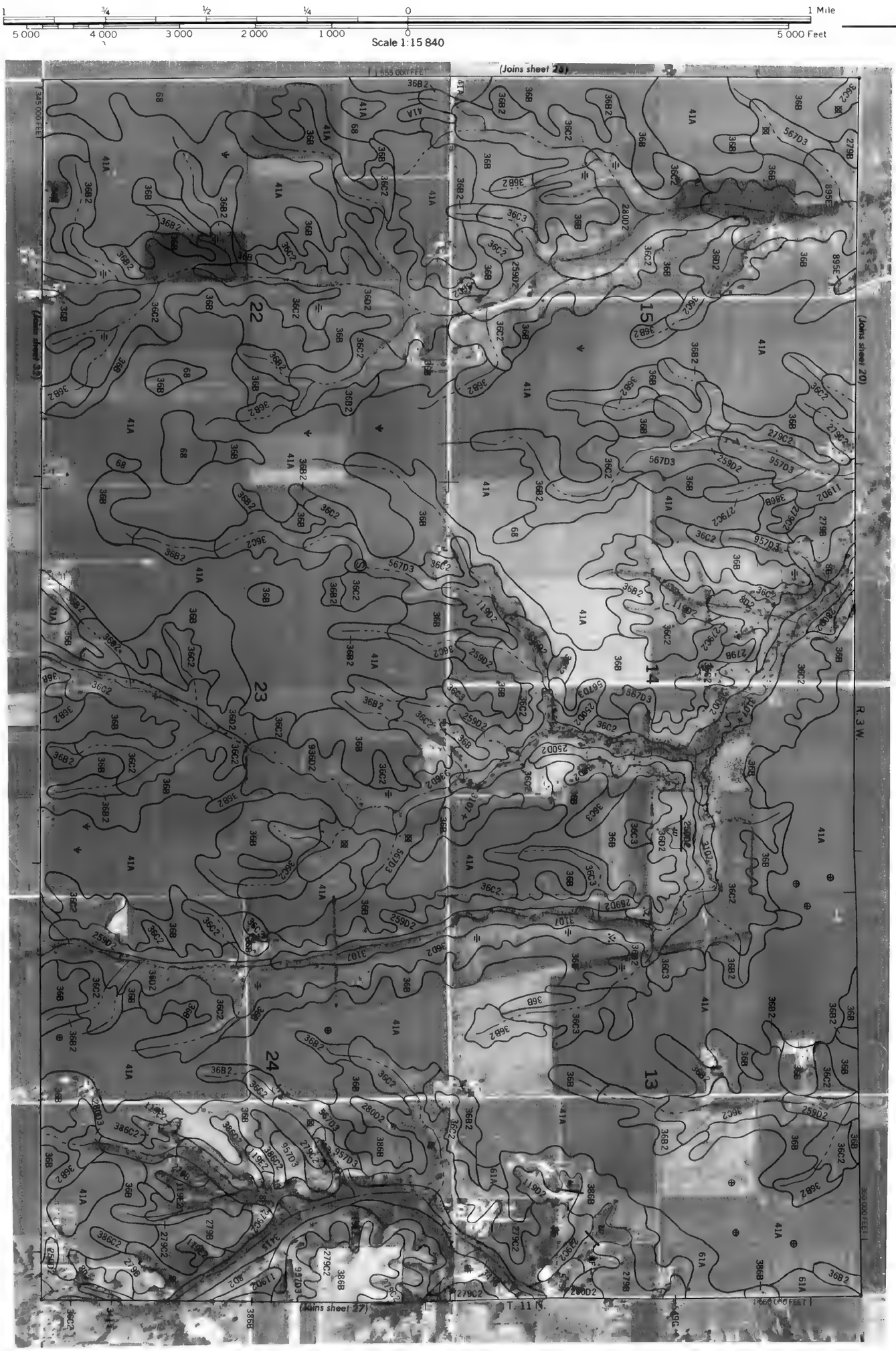
WARREN COUNTY, ILLINOIS NO. 24

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 25





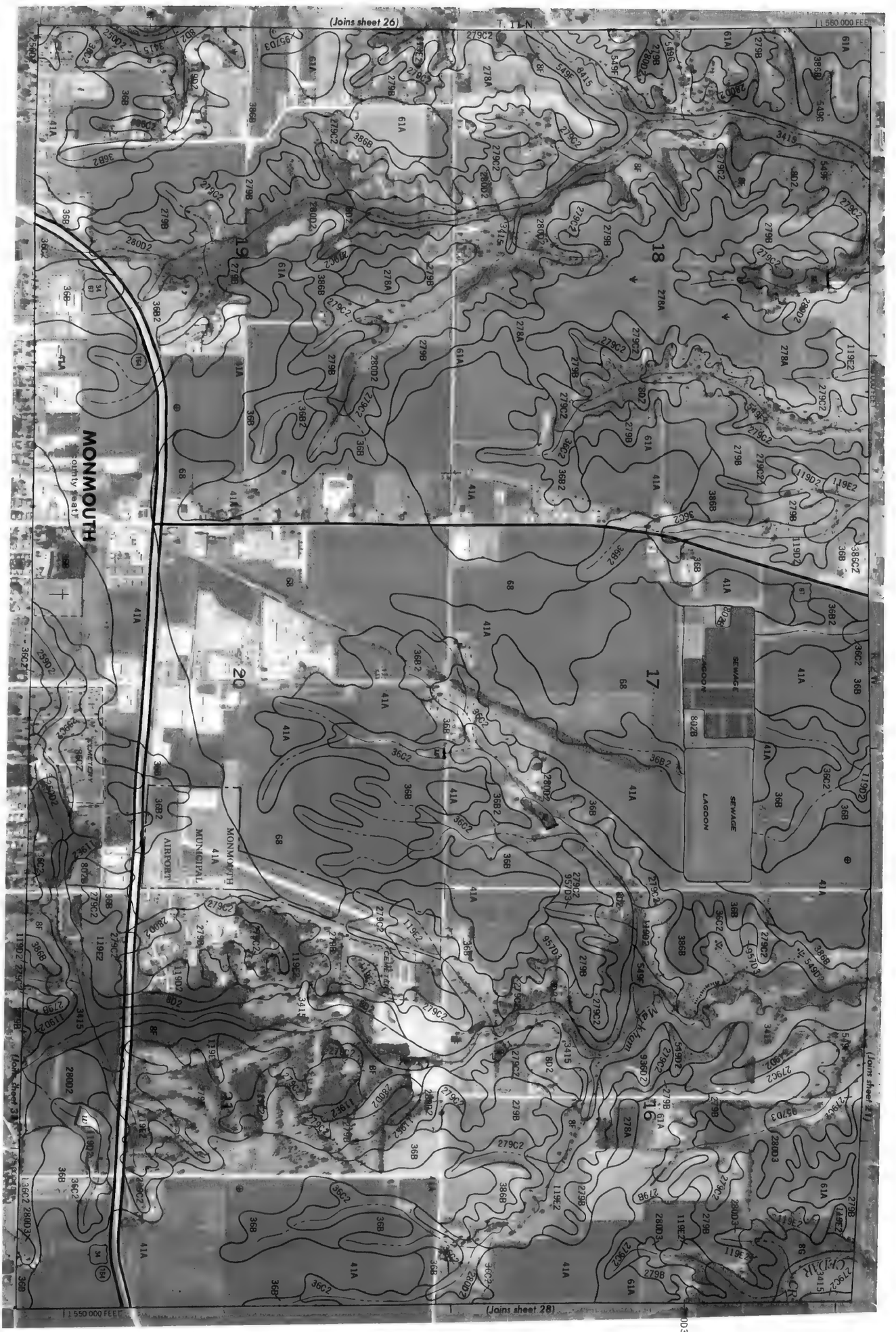
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 26

WARREN COUNTY, ILLINOIS NO. 26

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

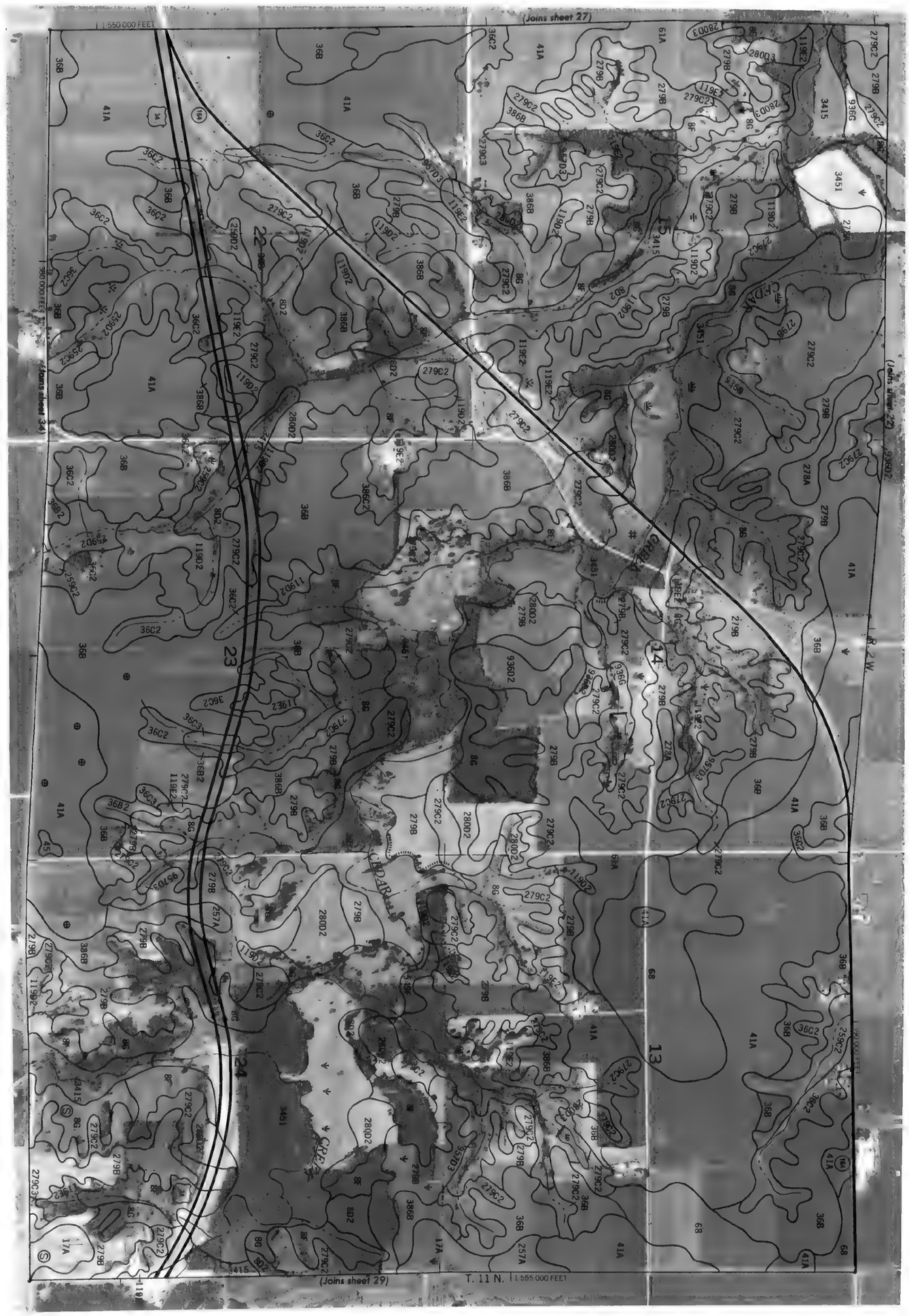
WARREN COUNTY, ILLINOIS NO. 27



1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 27

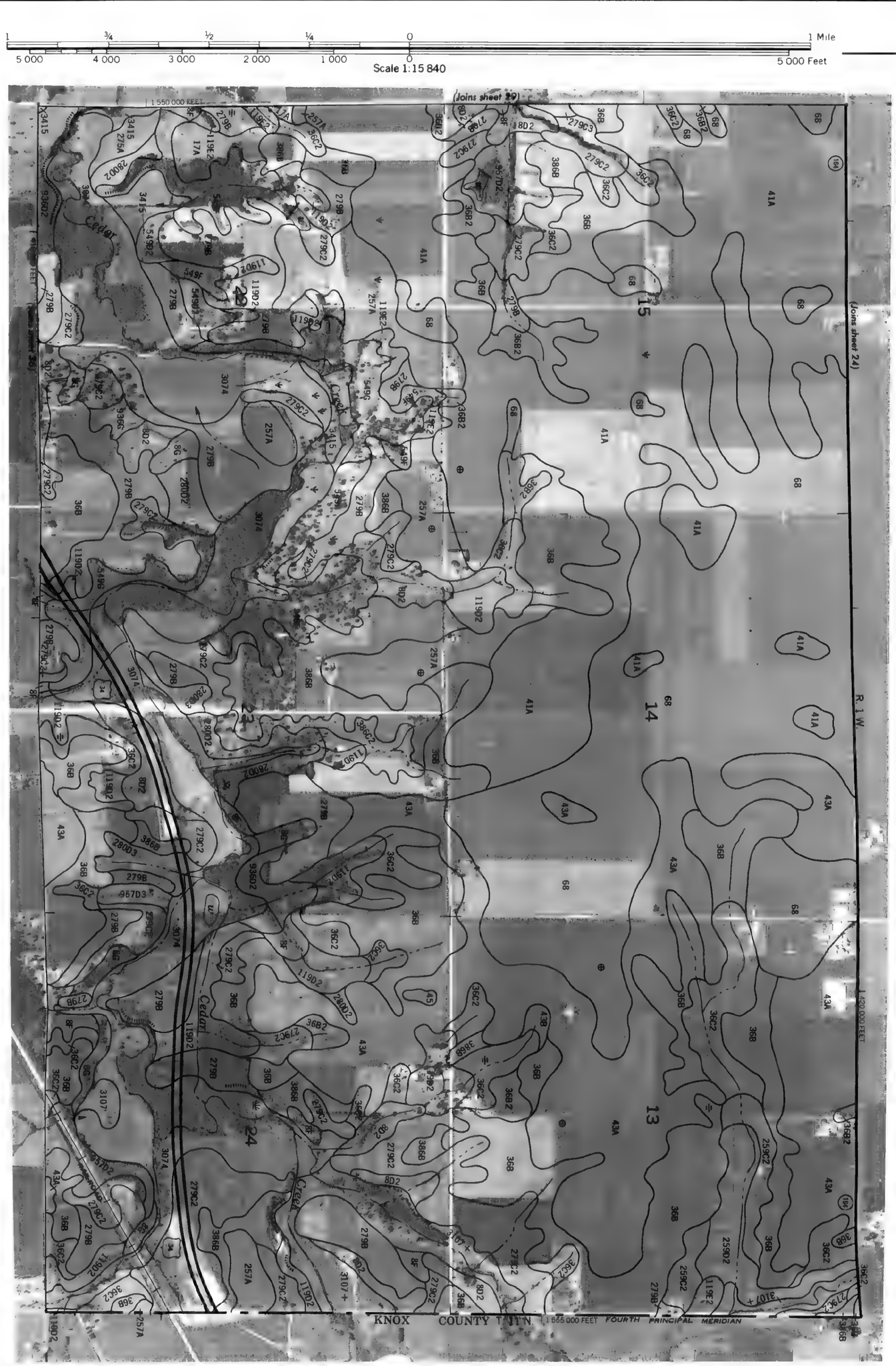


WARREN COUNTY, ILLINOIS NO. 28

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 29



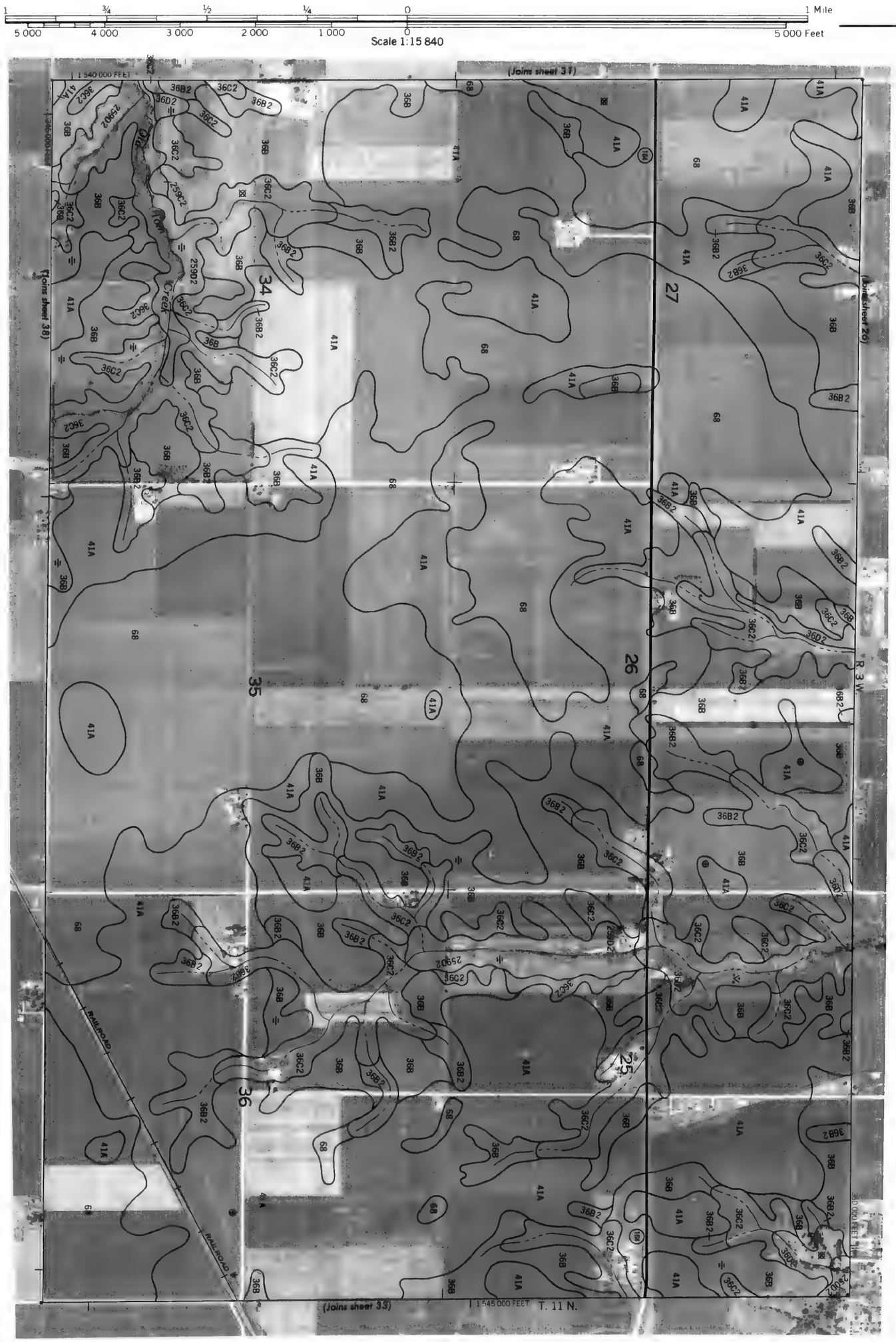
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 30

WARREN COUNTY, ILLINOIS NO. 30

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 31



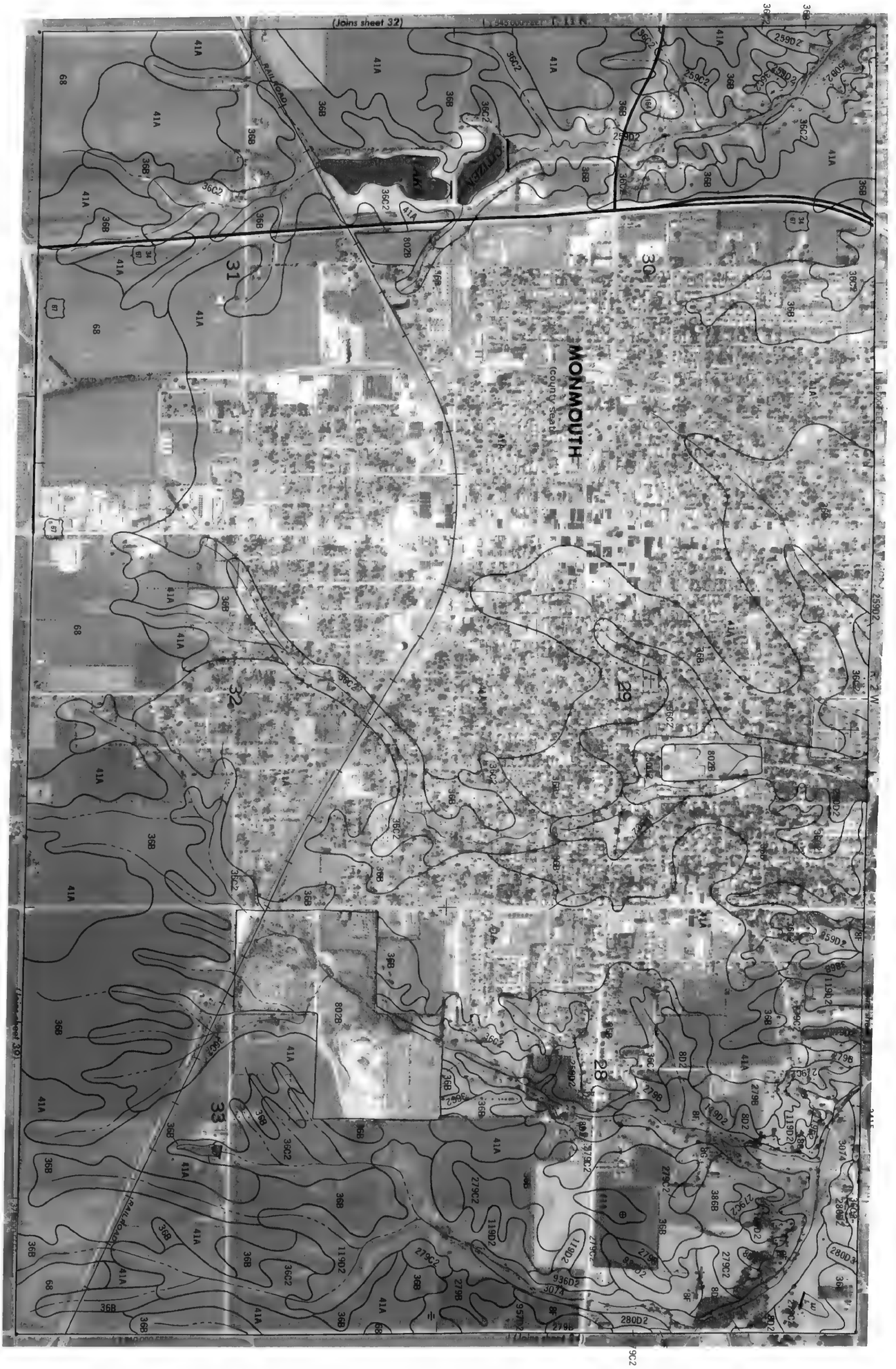
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 32

WARREN COUNTY, ILLINOIS NO. 32

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 33



SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 33

1 ¾ ½ ¼ 0 1 Mile

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N

WARREN COUNTY, ILLINOIS NO. 34

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 35

35

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000 FEET

R. 1 W.

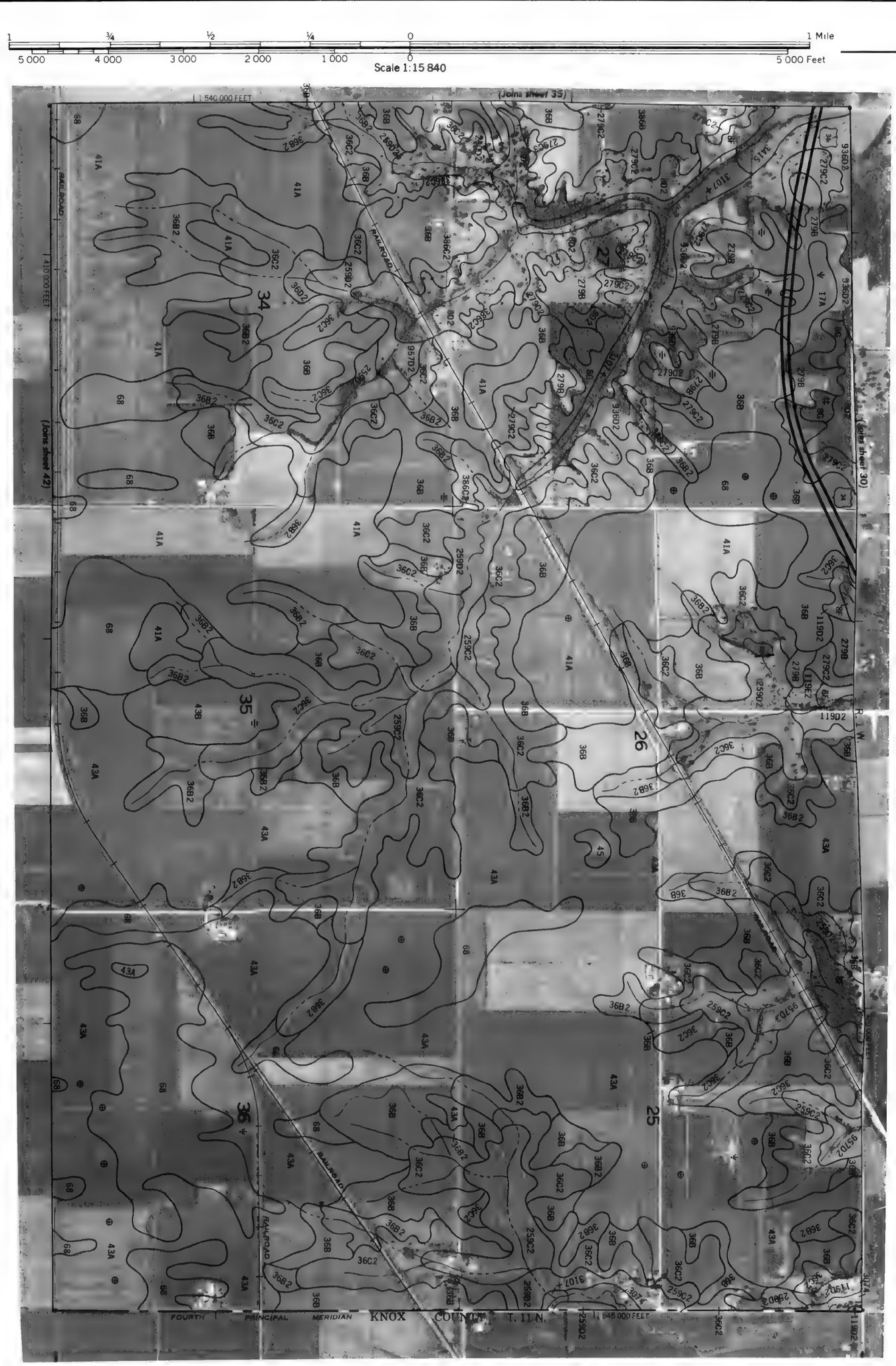
(Joins sheet 29)

(Joins sheet 34)

(Joins sheet 36)

RAILROAD

Cameron



SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 36

WARREN COUNTY, ILLINOIS NO. 36

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

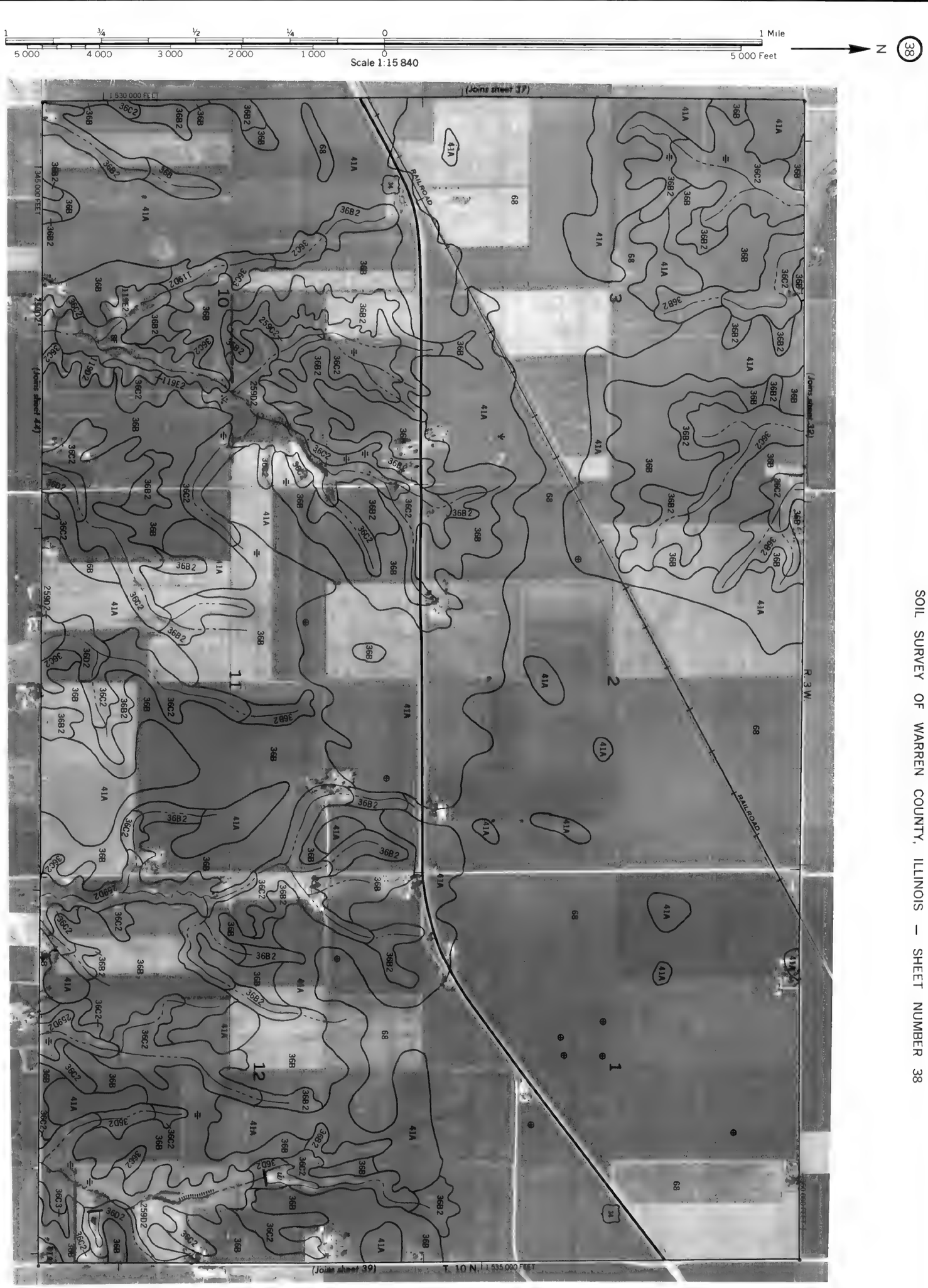
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 37

1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 37



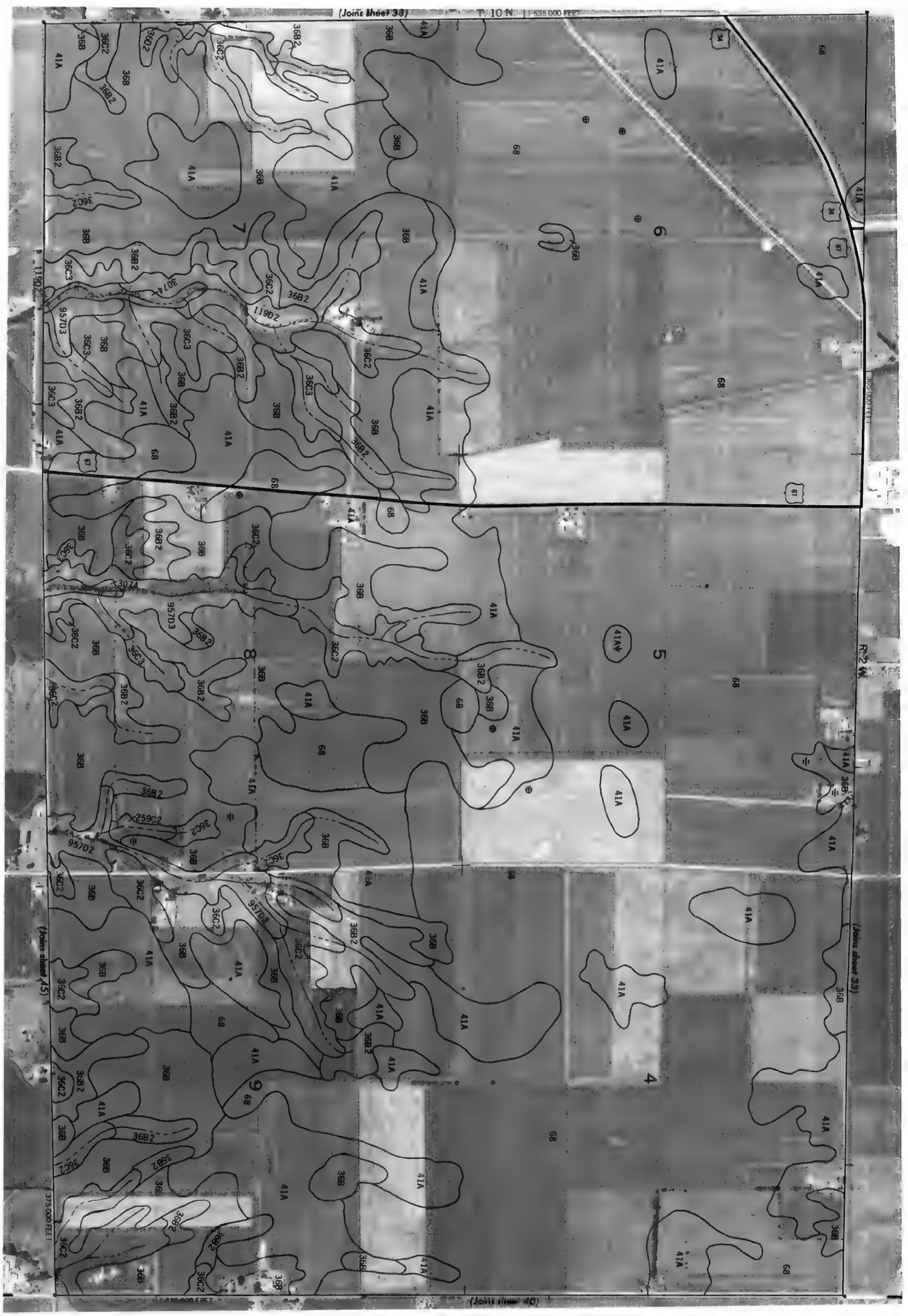
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 38

WARREN COUNTY, ILLINOIS NO. 38

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 39



1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 39

40

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1 000 2 000 3 000 4 000 5 000

(Joins sheet 34)

R. 2 W.

(Joins sheet 39)

(Joins sheet 41)

(Joins sheet 46)

1 930 000 FEET

1 935 000 FEET

380 000 FEET

RAILROAD

3 2 1 10 11 12

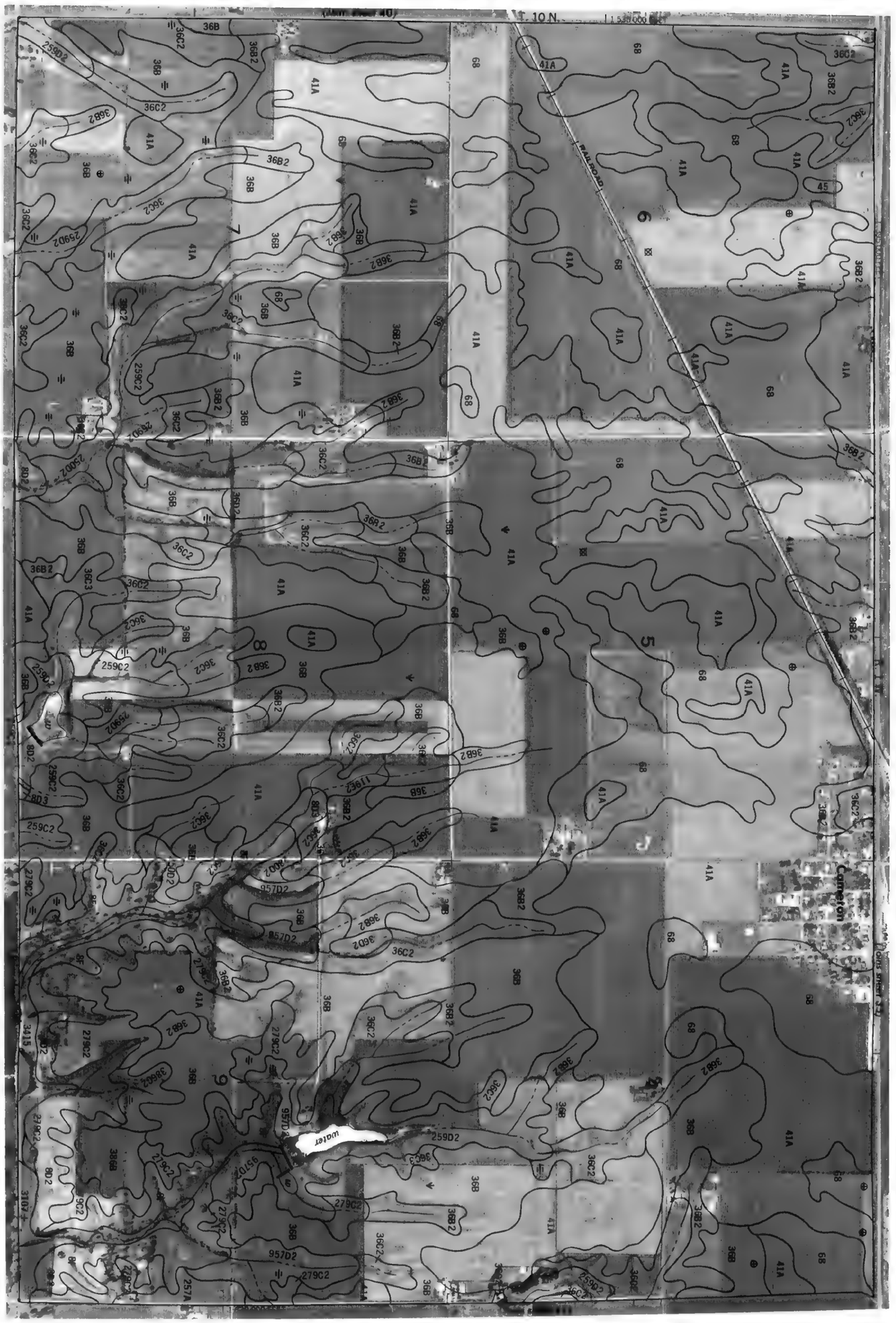
68 41A 36B 36B2 36C2 259D2

WARREN COUNTY, ILLINOIS NO. 40

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

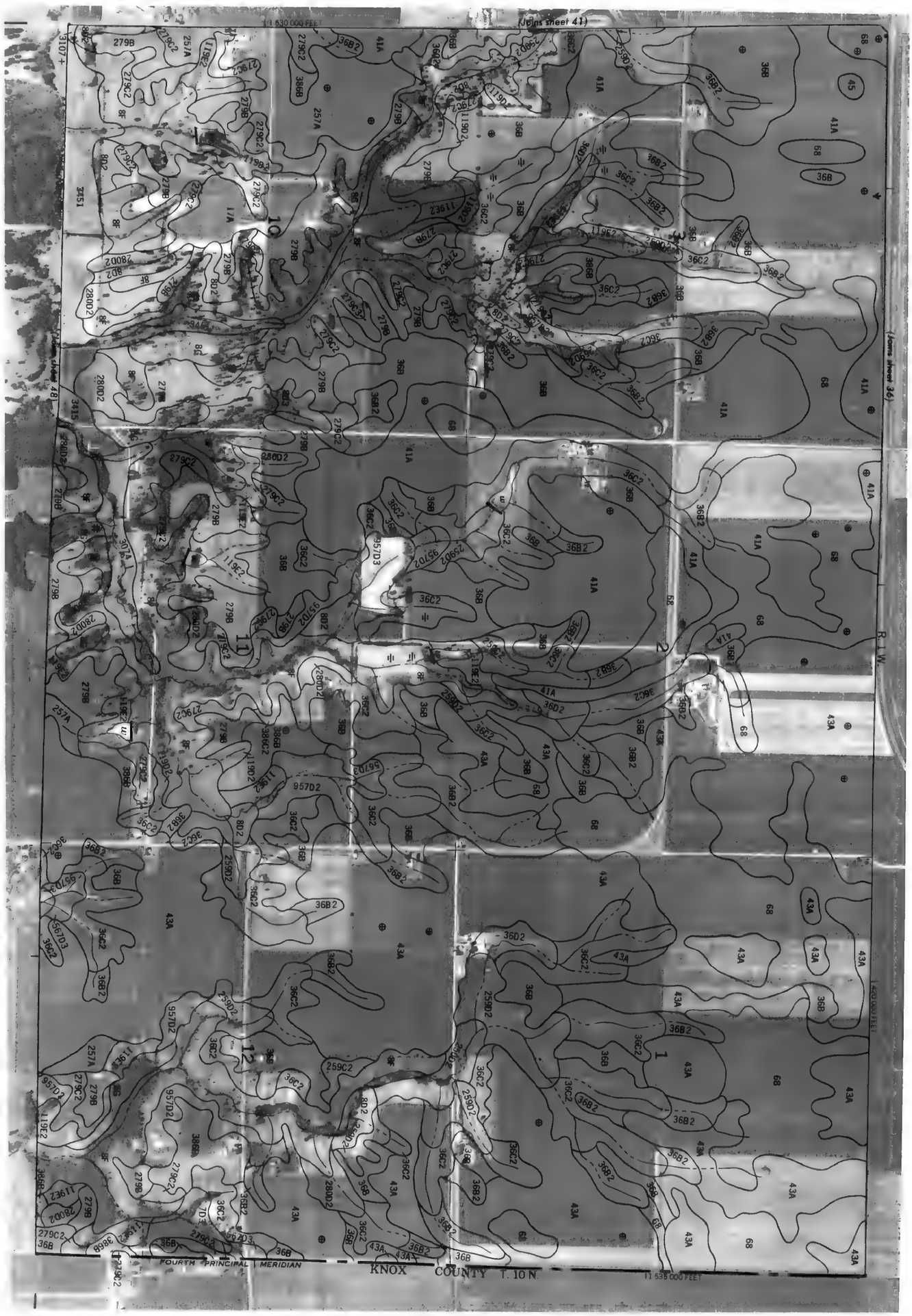
WARREN COUNTY, ILLINOIS NO. 41



SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 41

1 ¾ ½ ¼ 0 1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N

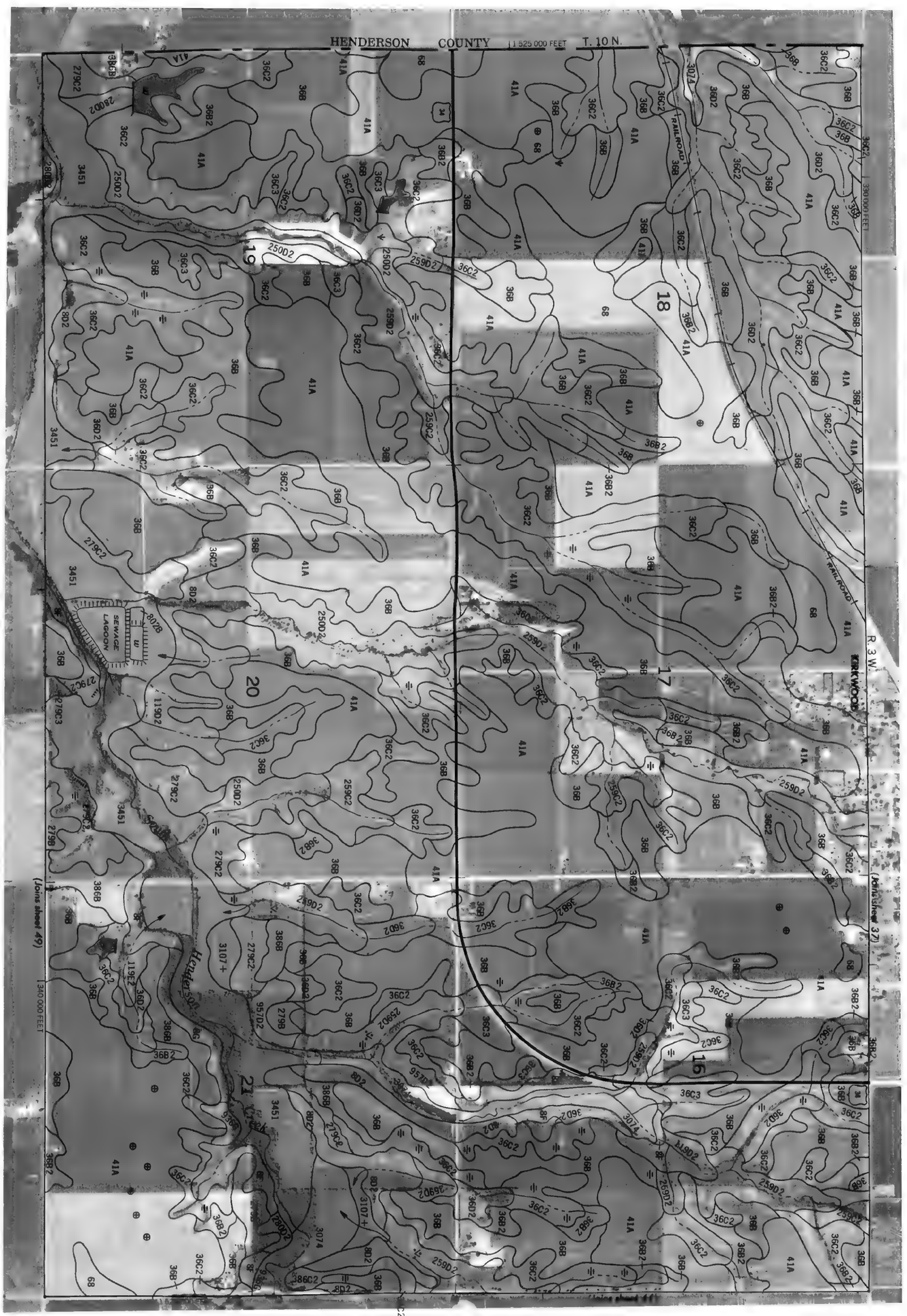


WARREN COUNTY, ILLINOIS NO. 42

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

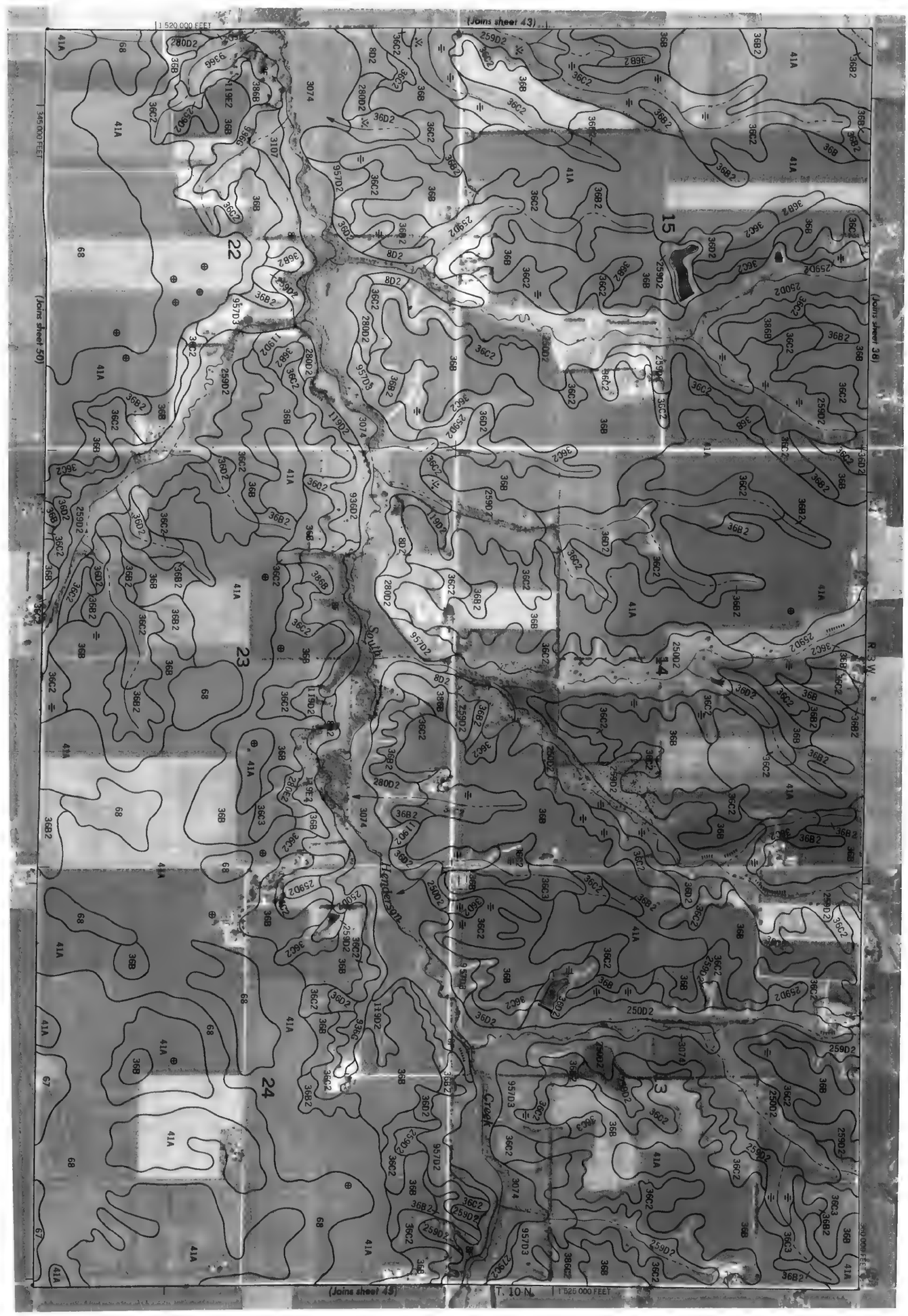
WARREN COUNTY, ILLINOIS NO. 43



1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 43



WARREN COUNTY, ILLINOIS NO. 44

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 45

45

N

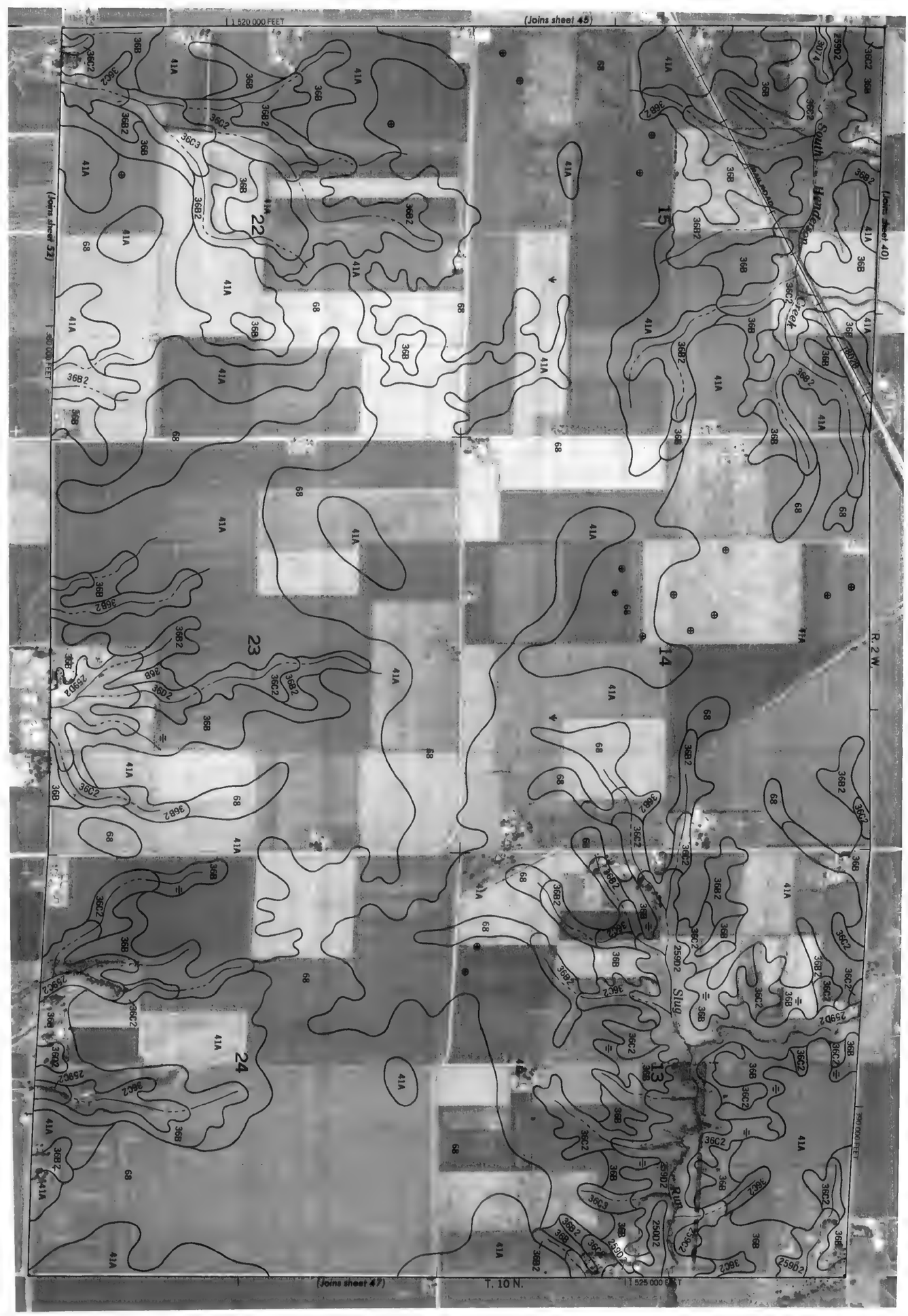
1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000



WARREN COUNTY, ILLINOIS NO. 46

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 47

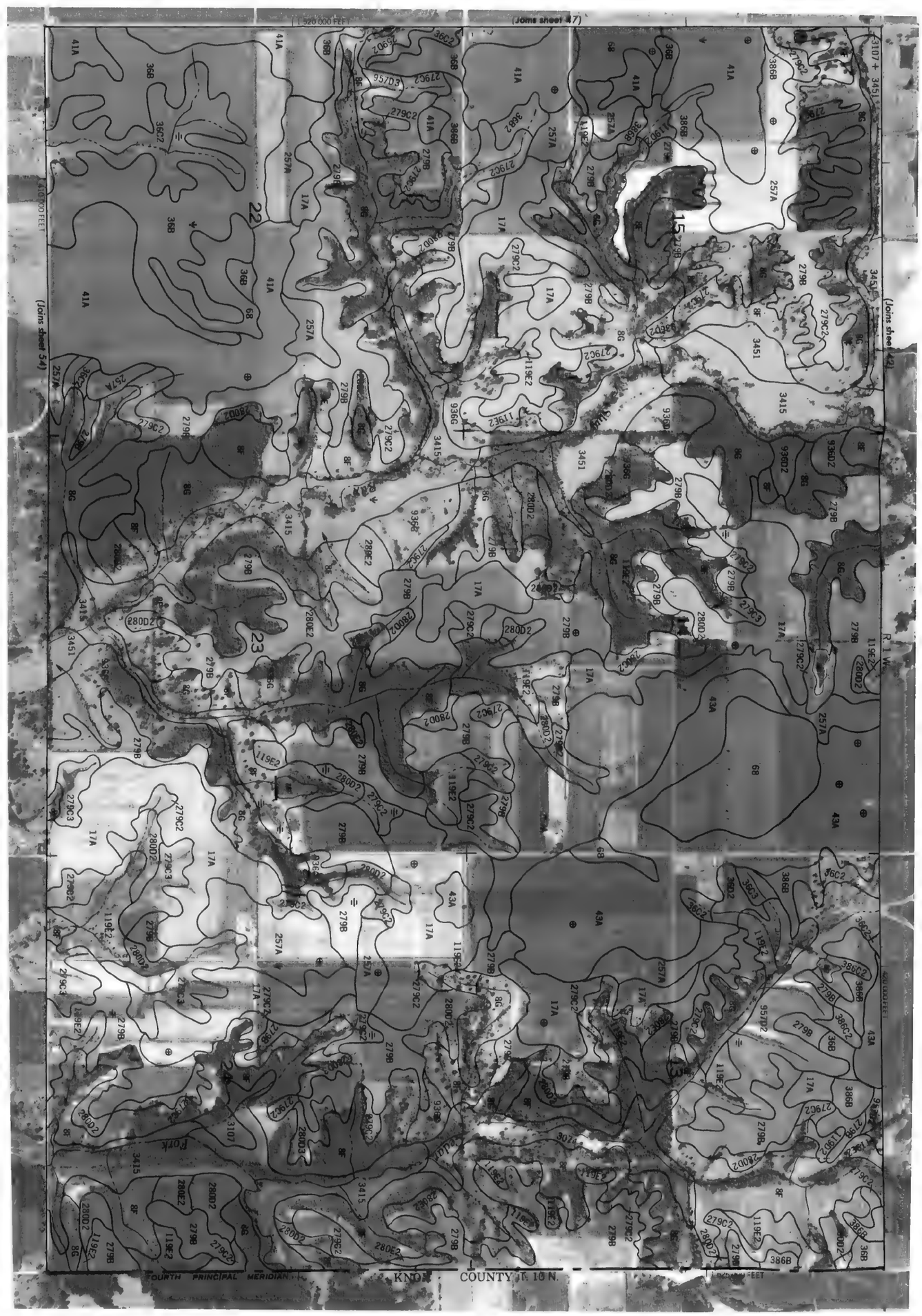
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 47

1 ¾ ½ ¼ 0 1 Mile

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N



WARREN COUNTY, ILLINOIS NO. 48

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 49

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 50

WARREN COUNTY, ILLINOIS NO. 50

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

51

N

1 Mile

5 000 Feet

Scale 1:15 840

1 0 1 000 2 000 3 000 4 000 5 000

¼ ½ ¾

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 51

WARREN COUNTY, ILLINOIS NO. 52

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 53

53

N

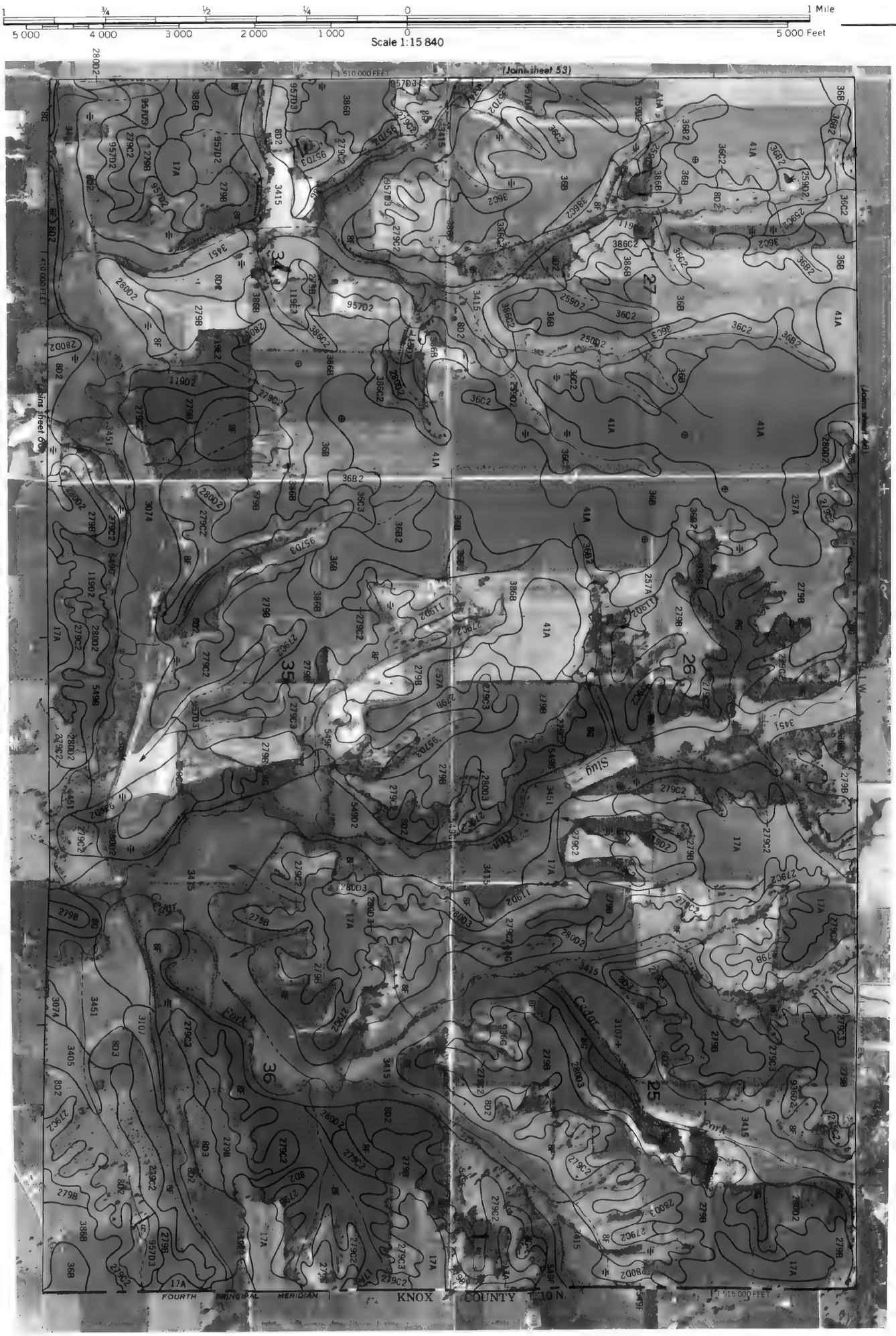
1 Mile

5 000 Feet

Scale 1:15 840

1 0 ¼ ½ ¾ 1

5 000 4 000 3 000 2 000 1 000 0

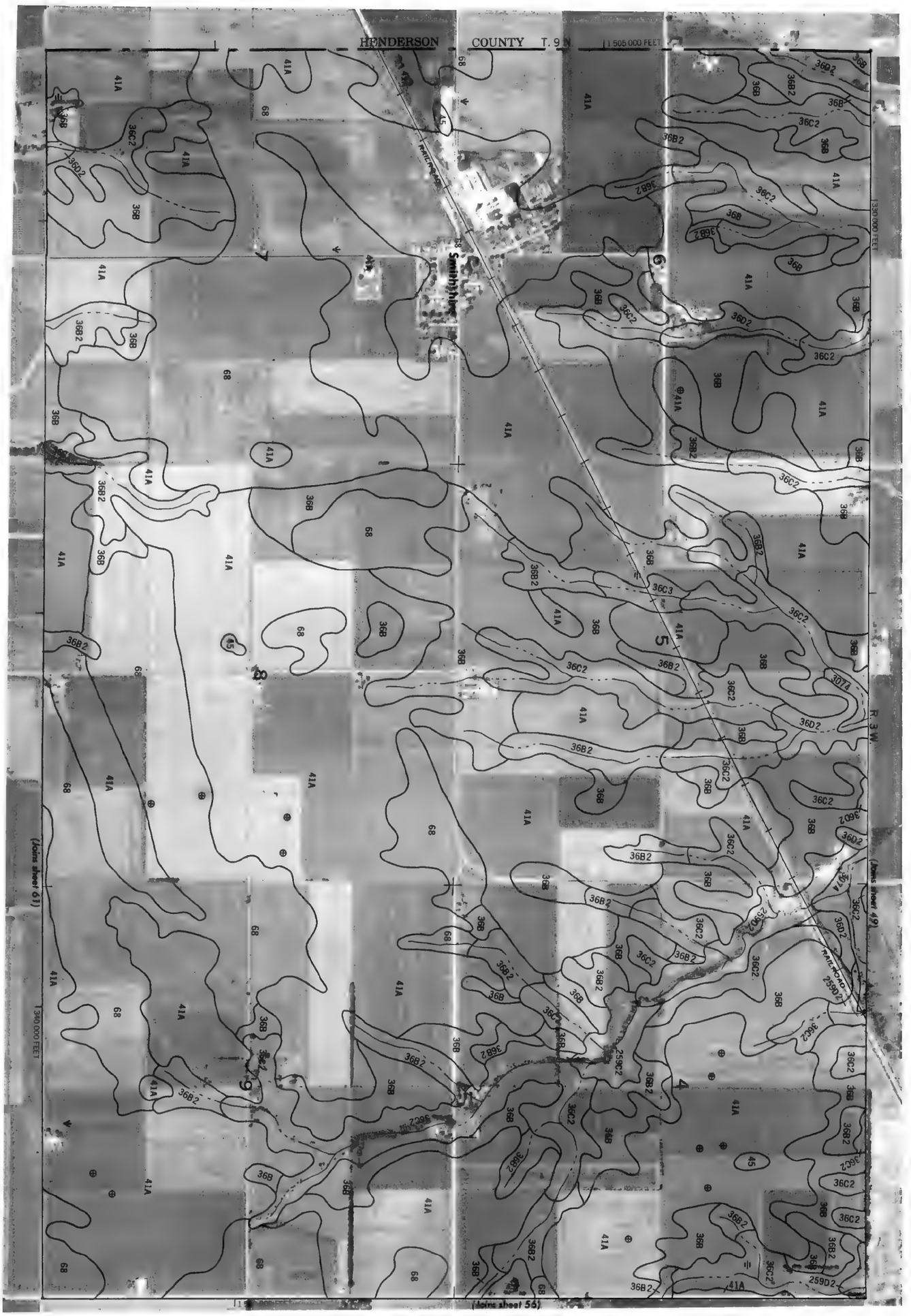


WARREN COUNTY, ILLINOIS NO. 54

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 55



1 3/4 1/2 1/4 0 1 Mile

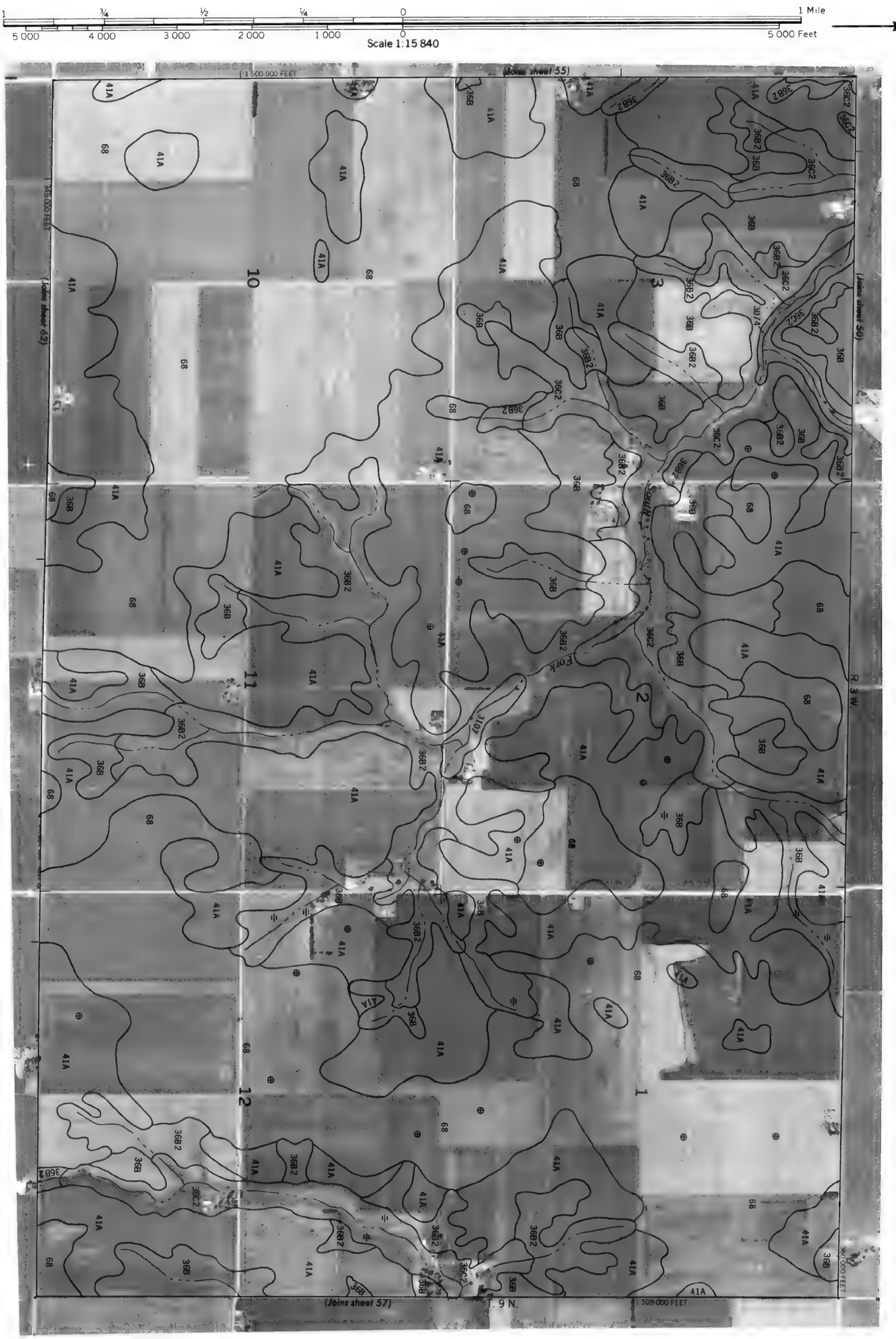
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N

55

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 55



WARREN COUNTY, ILLINOIS NO. 56

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 57

58

N

1 Mile

5 000 Feet

Scale 1:15 840

R. 2 W.

T. 9 N.

(Joins sheet 57)

(Joins sheet 59)

(Joins sheet 64)

380 000 FEET

549000 FEET

1 500 000 FEET

Picaume Creek

WARREN COUNTY, ILLINOIS NO. 58

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 59

59

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

WARREN COUNTY, ILLINOIS NO. 60

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 61

61

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

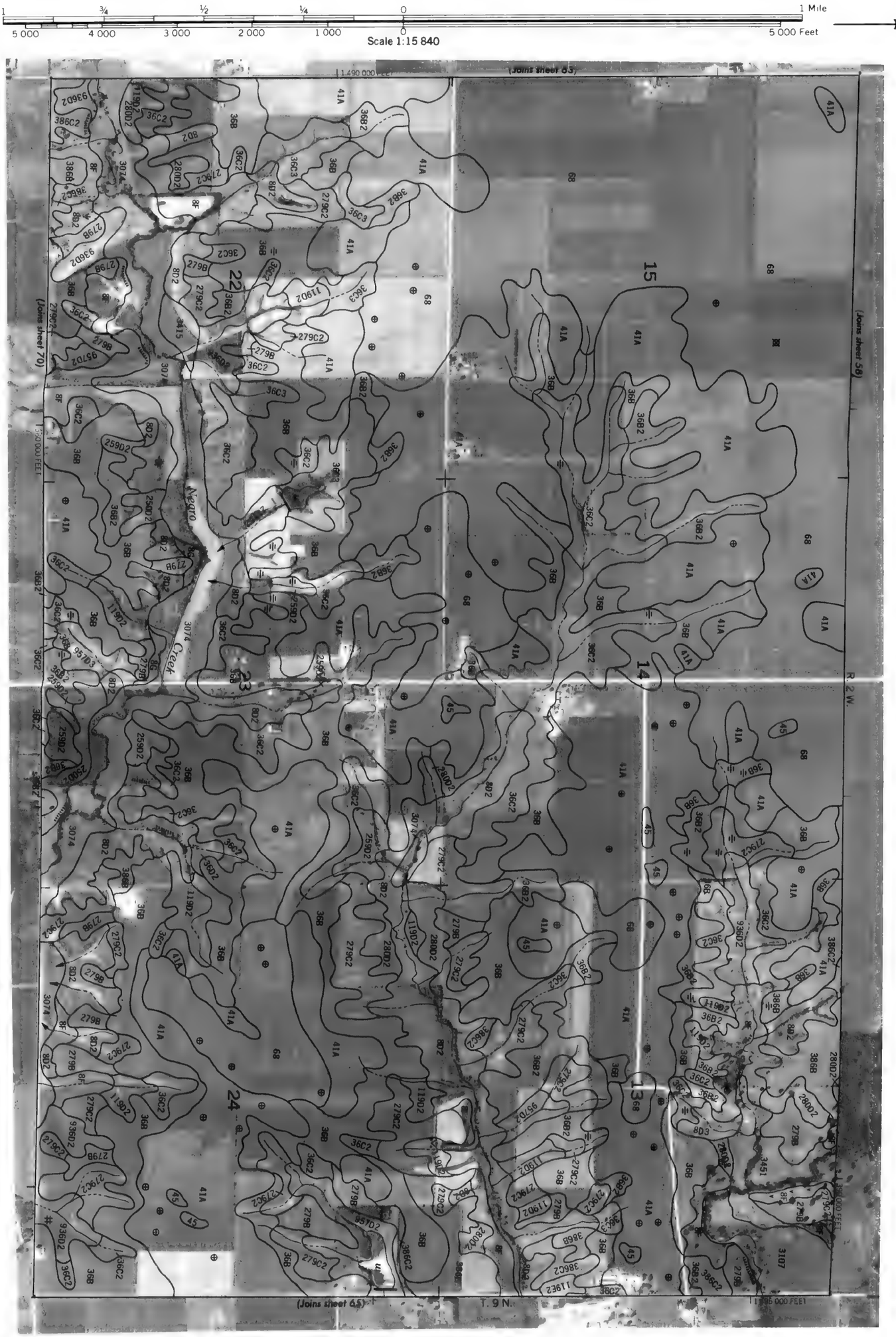
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 62

WARREN COUNTY, ILLINOIS NO. 62

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 63

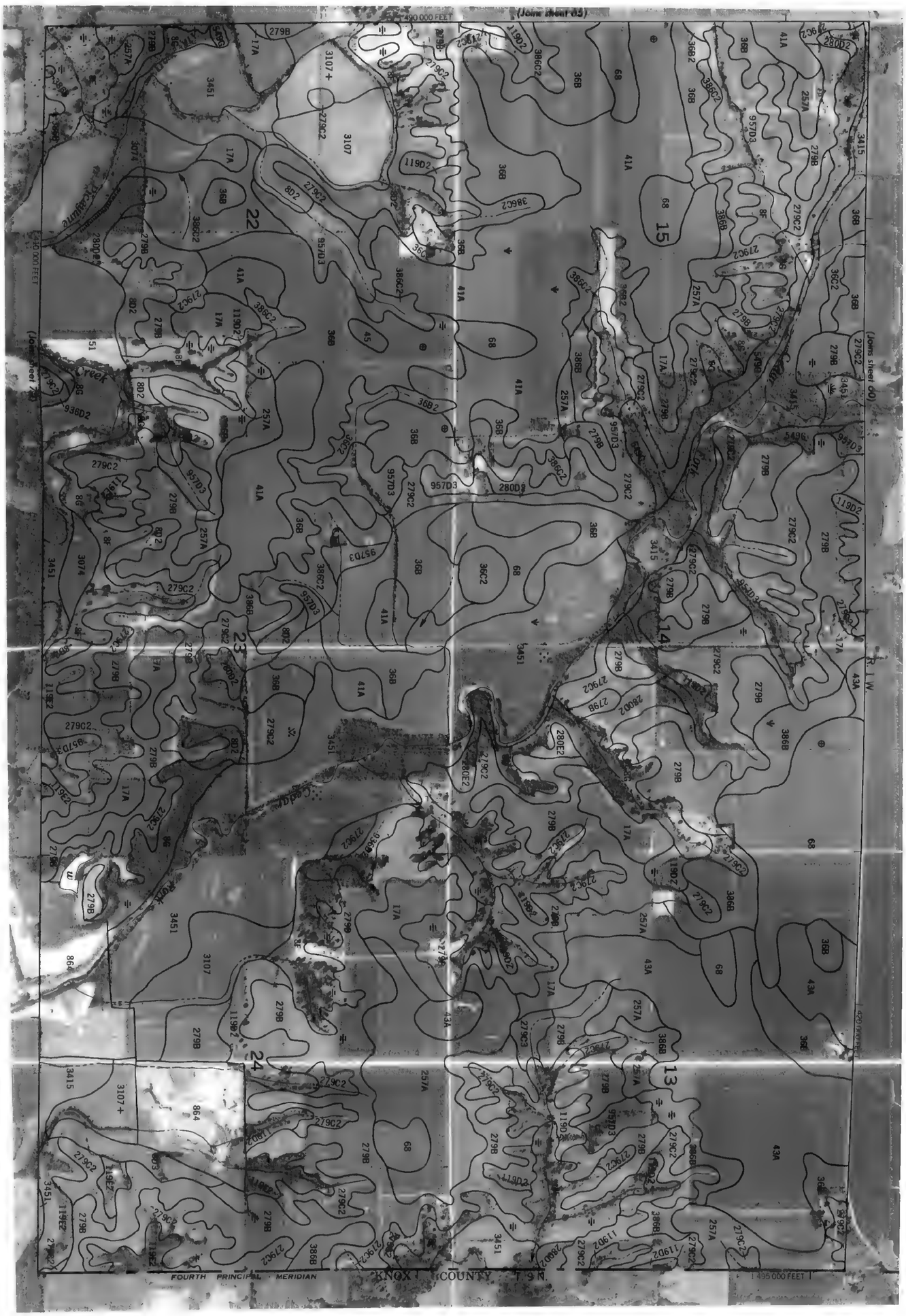


WARREN COUNTY, ILLINOIS NO. 64

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 65

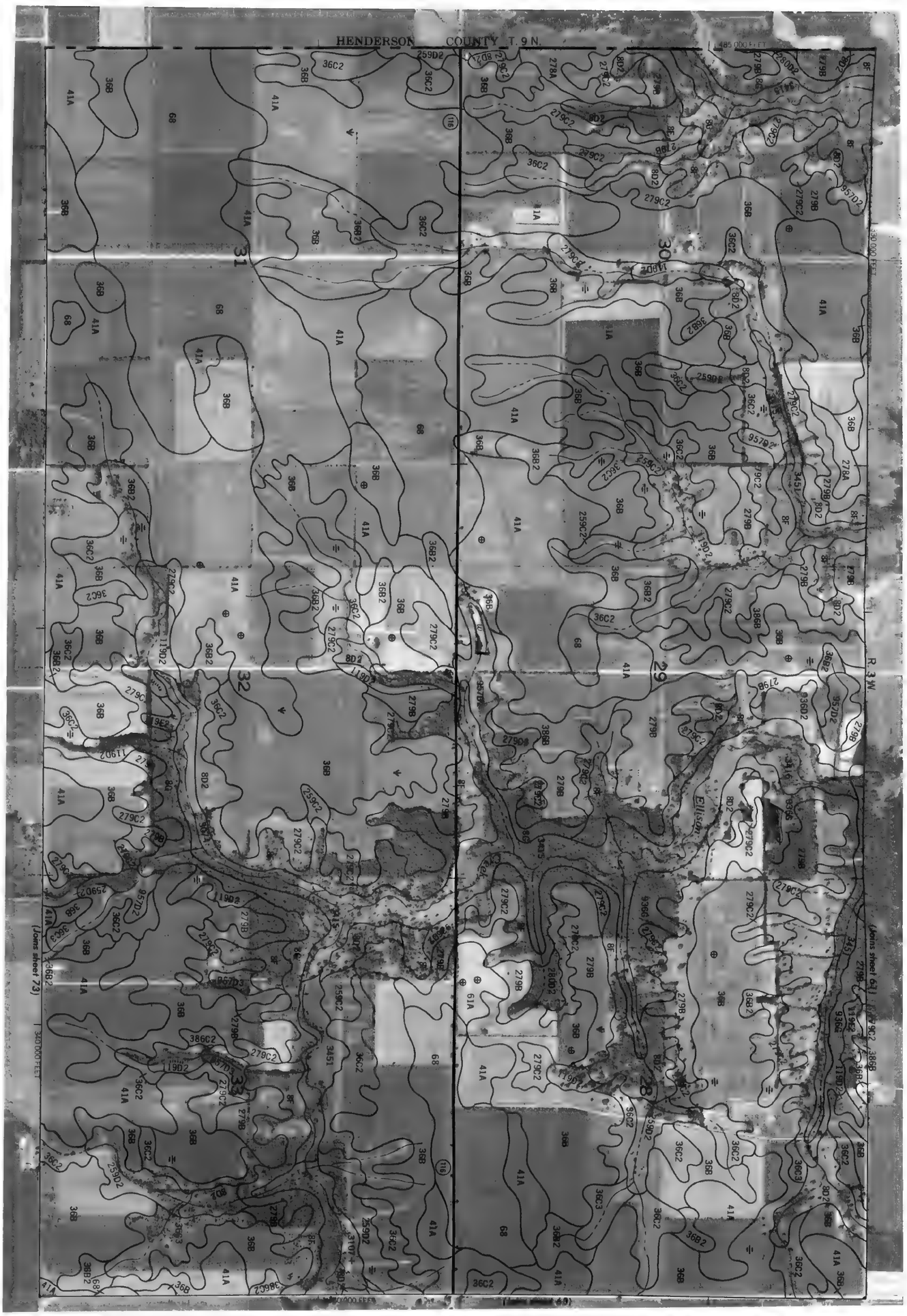


WARREN COUNTY, ILLINOIS NO. 66

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 67



1 ¾ ½ ¼ 0 1 Mile

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 67

68

N

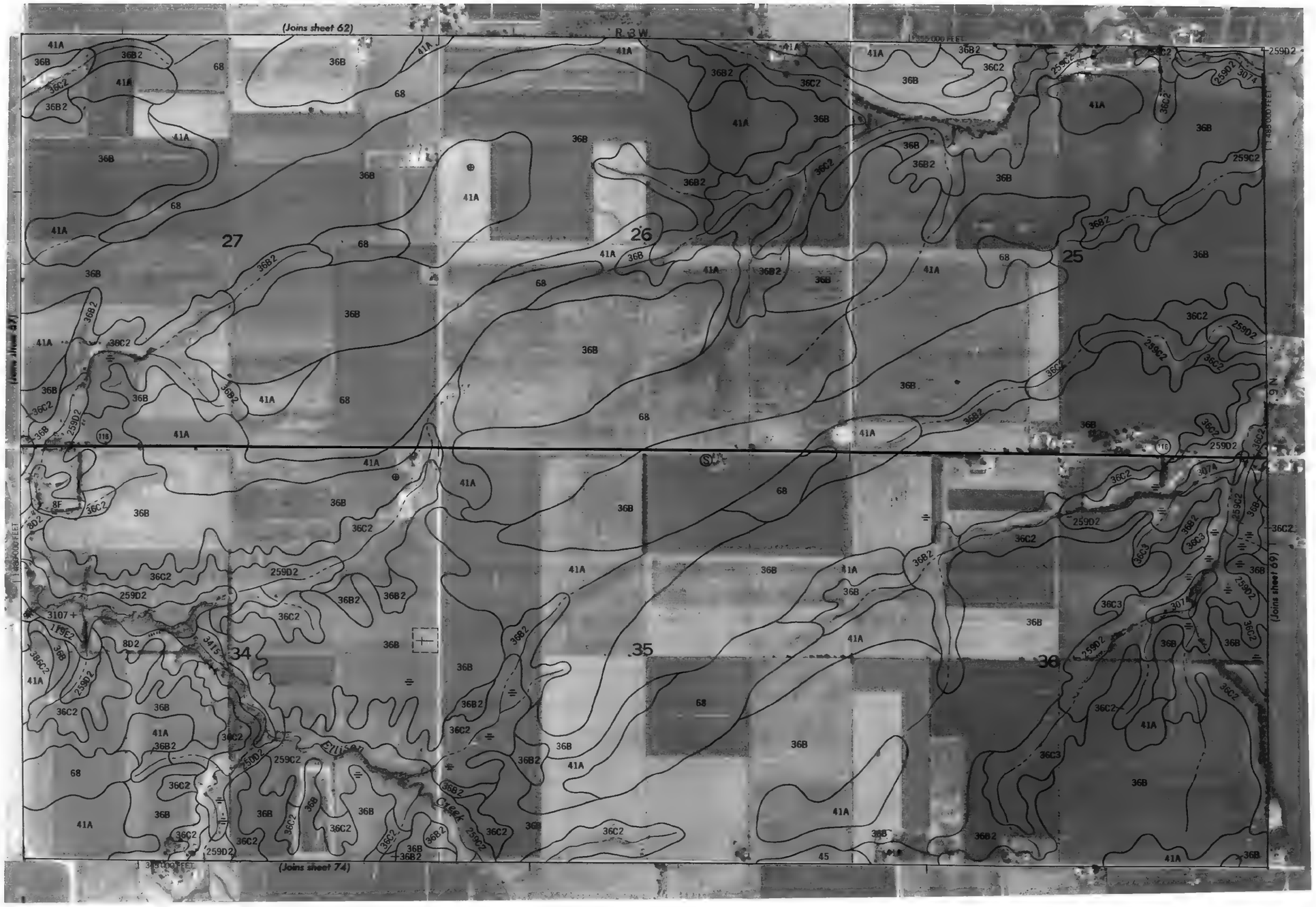
1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

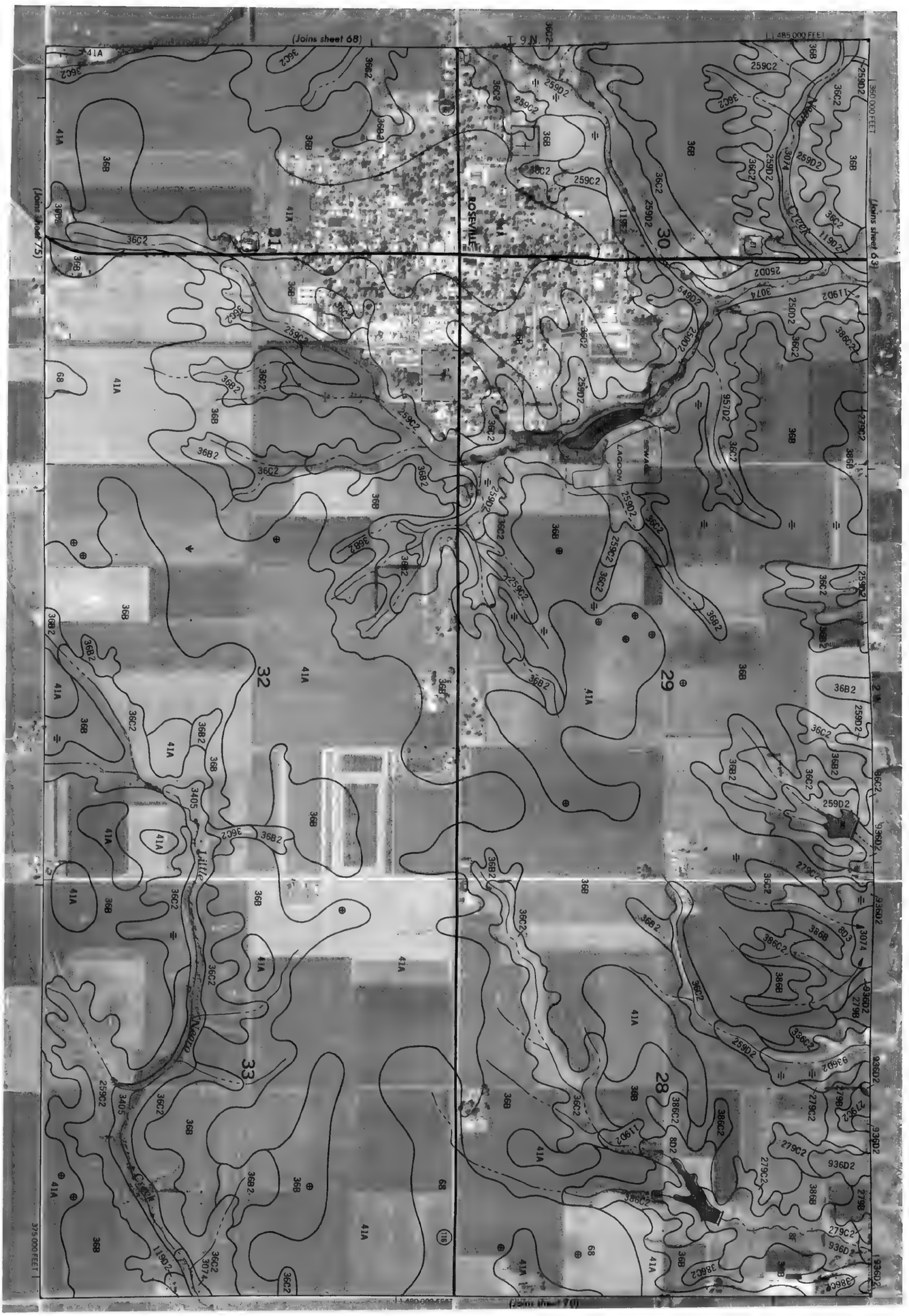


WARREN COUNTY, ILLINOIS NO. 68

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 69

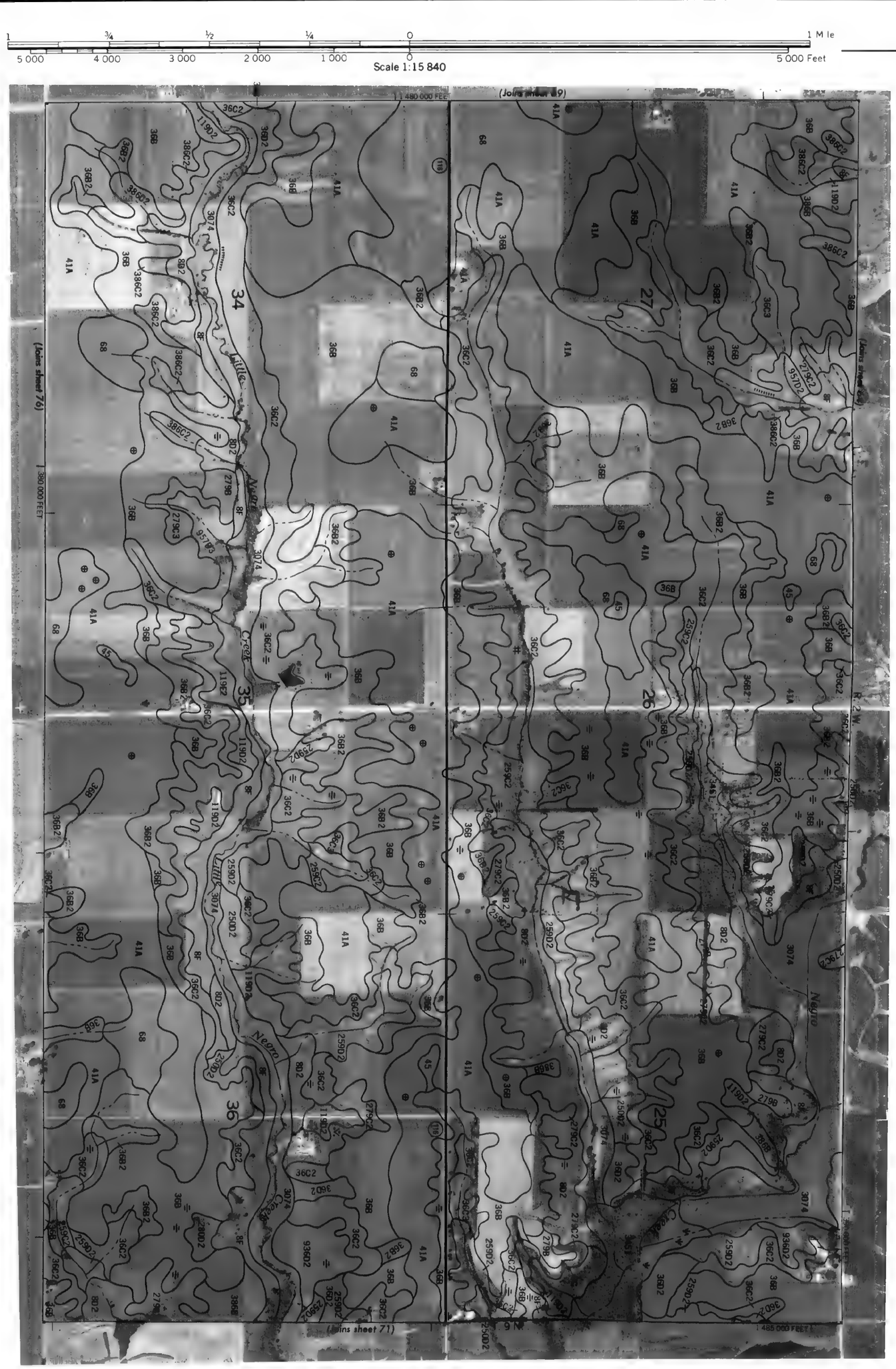


1 ¾ ½ ¼ 0 1 Mile

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

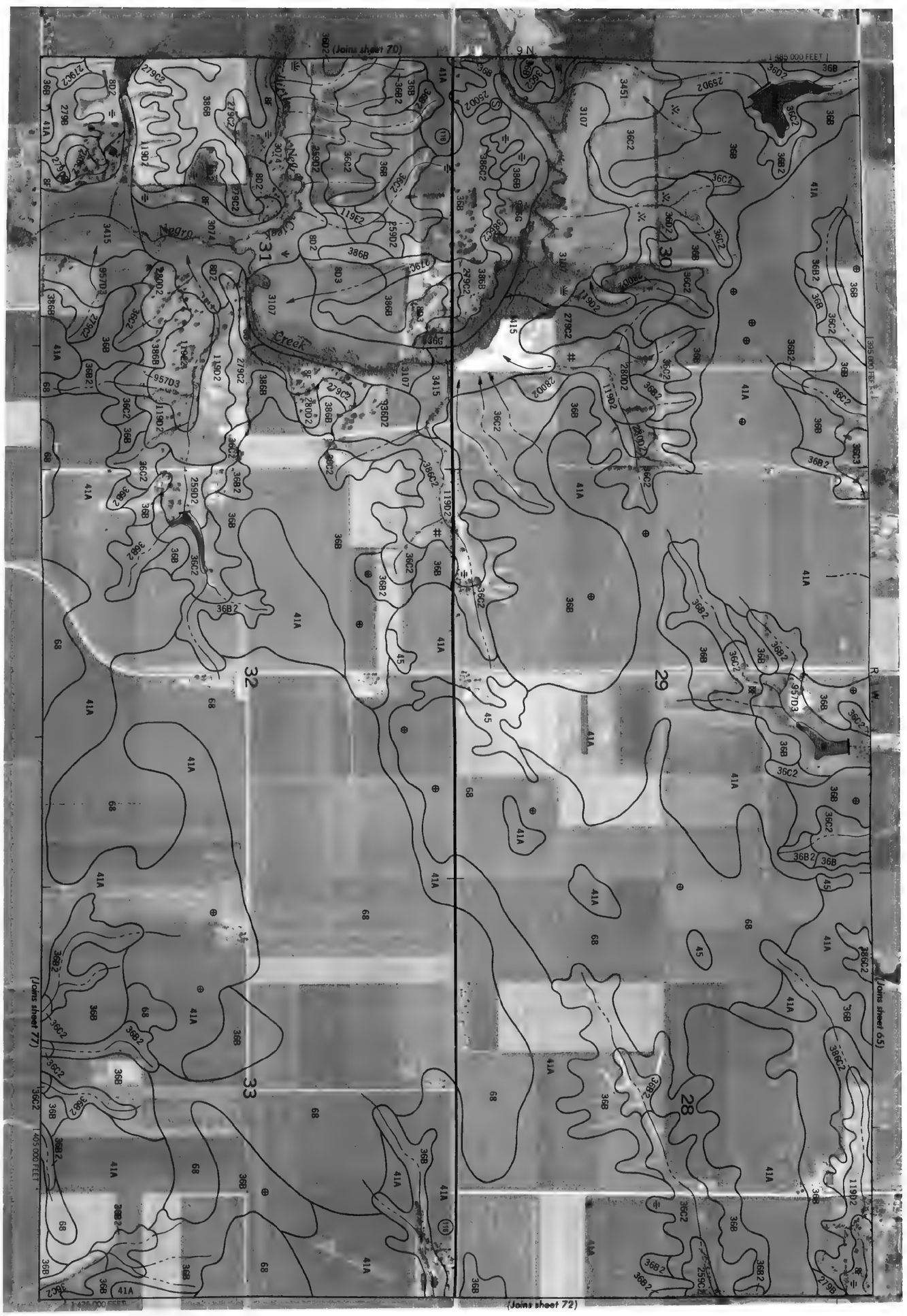
N



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 71



1 0 ¼ ½ ¾ 1 Mile

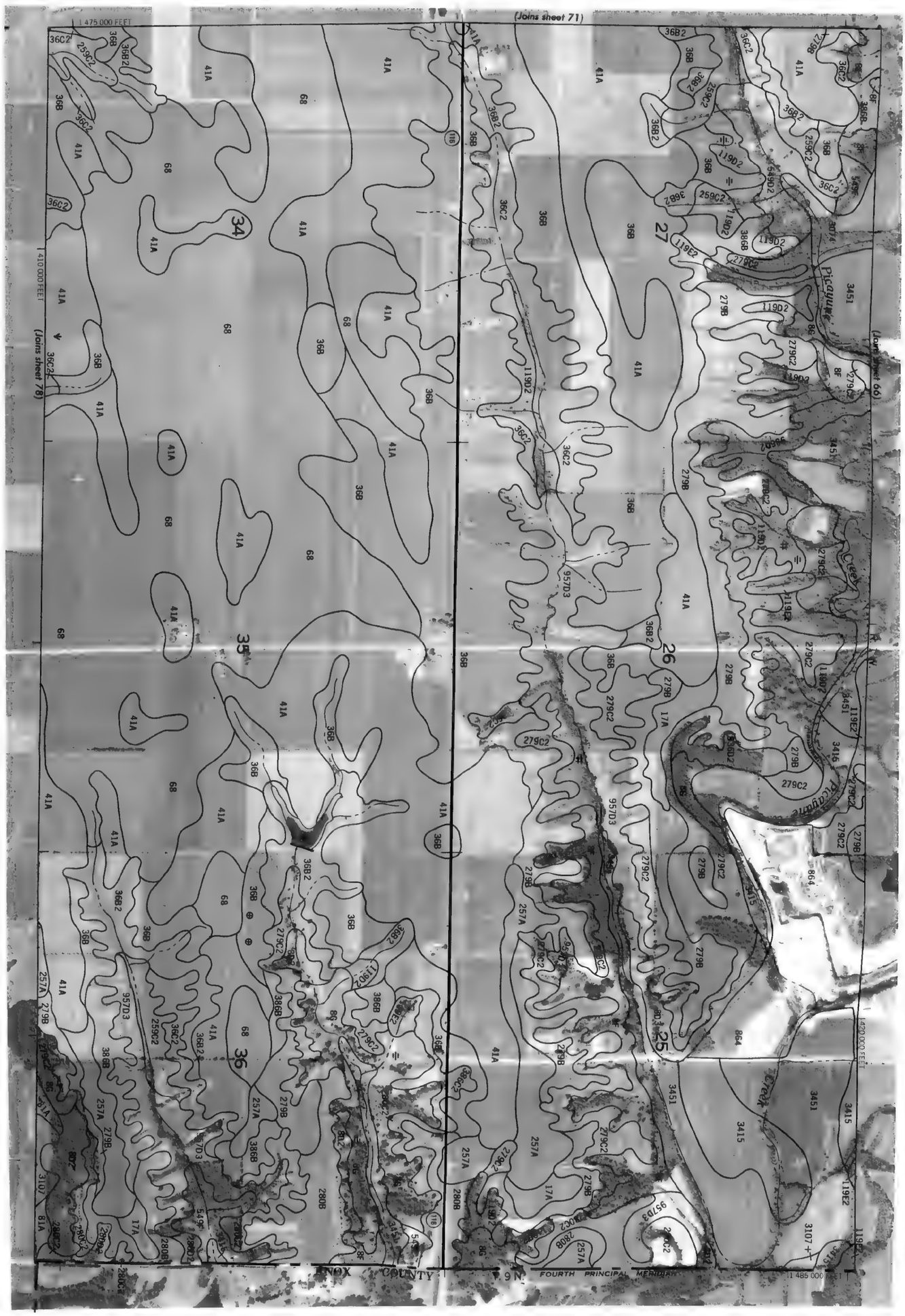
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N

71

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 71



WARREN COUNTY, ILLINOIS NO. 72

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 73

74

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

R. 3 W.

8 N.

355 000 FEET

1 475 000 FEET

1 470 000 FEET

345 000 FEET

(Joins sheet 68) (Joins 69)

(Joins sheet 73)

(Joins sheet 75)

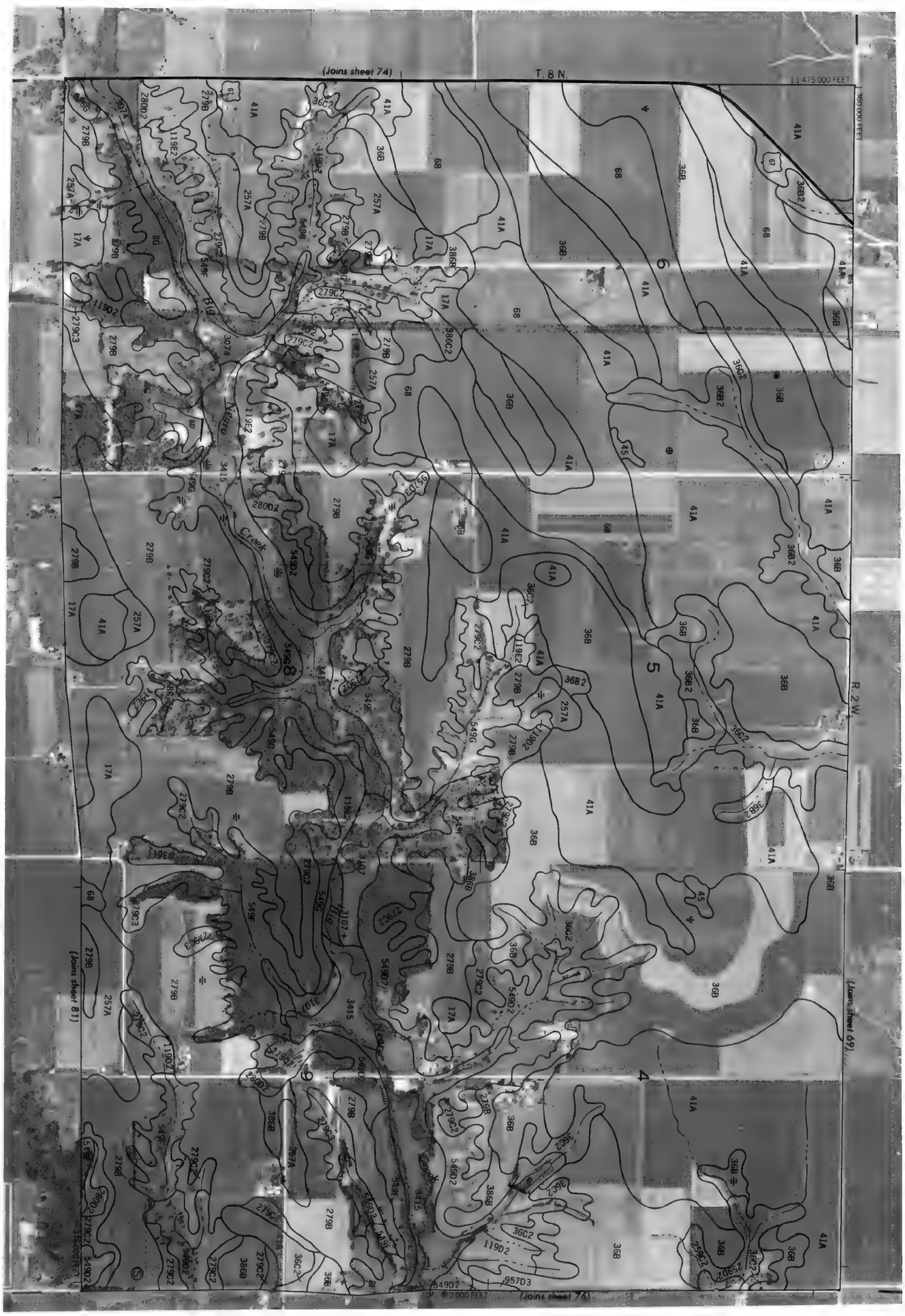
(Joins sheet 80)

WARREN COUNTY, ILLINOIS NO. 74

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 75



1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N

75

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 75

76

N

1 Mile 5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

(Joins sheet 70)

(Joins sheet 75)

(Joins sheet 77)

(Joins sheet 82)

R. 2 W.

T. 8 N.

390 000 FEET

380 000 FEET

470 000 FEET

Big Negro Creek

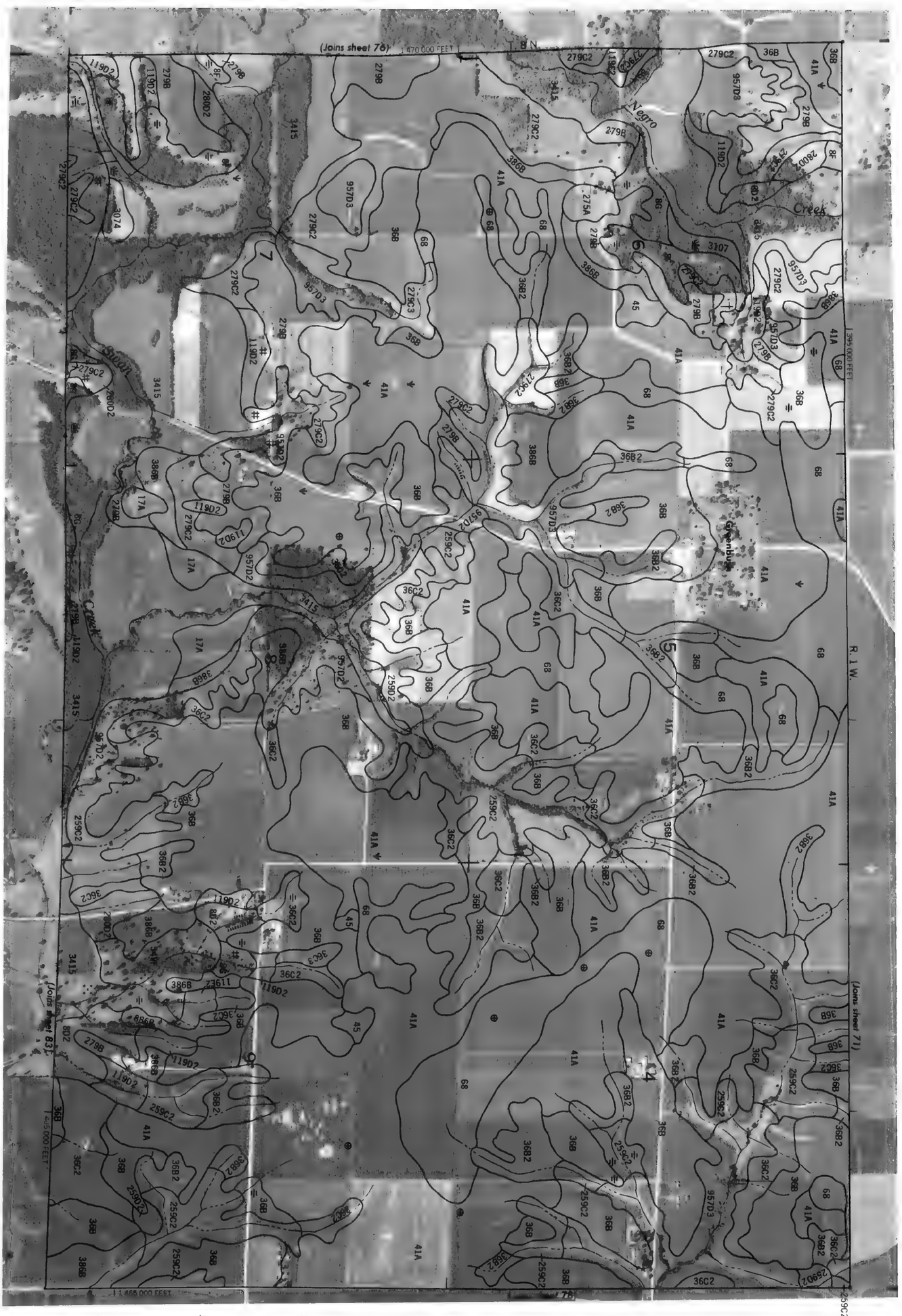
South Negro Creek

WARREN COUNTY, ILLINOIS NO. 76

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 77



1 ¾ ½ ¼ 0 1 Mile

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

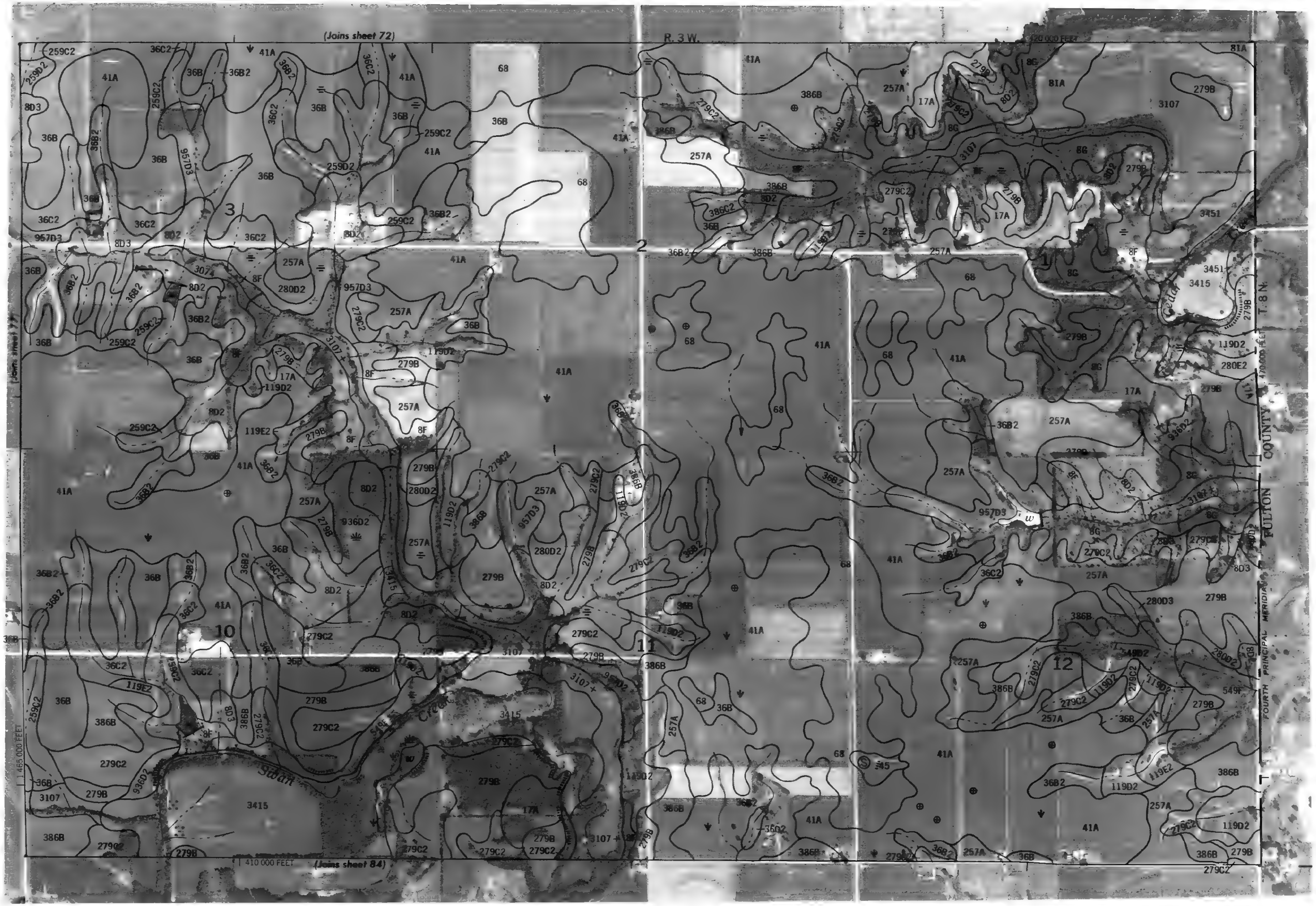
Scale 1:15 840

N

77

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 77

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 78



WARREN COUNTY, ILLINOIS NO. 78

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 79

1 ¾ ½ ¼ 0 1 Mile

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 79

1 ¾ ½ ¼ 0 1 Mile

5 000 4 000 3 000 2 000 1 000 0 5 000 Feet

Scale 1:15 840

N

80

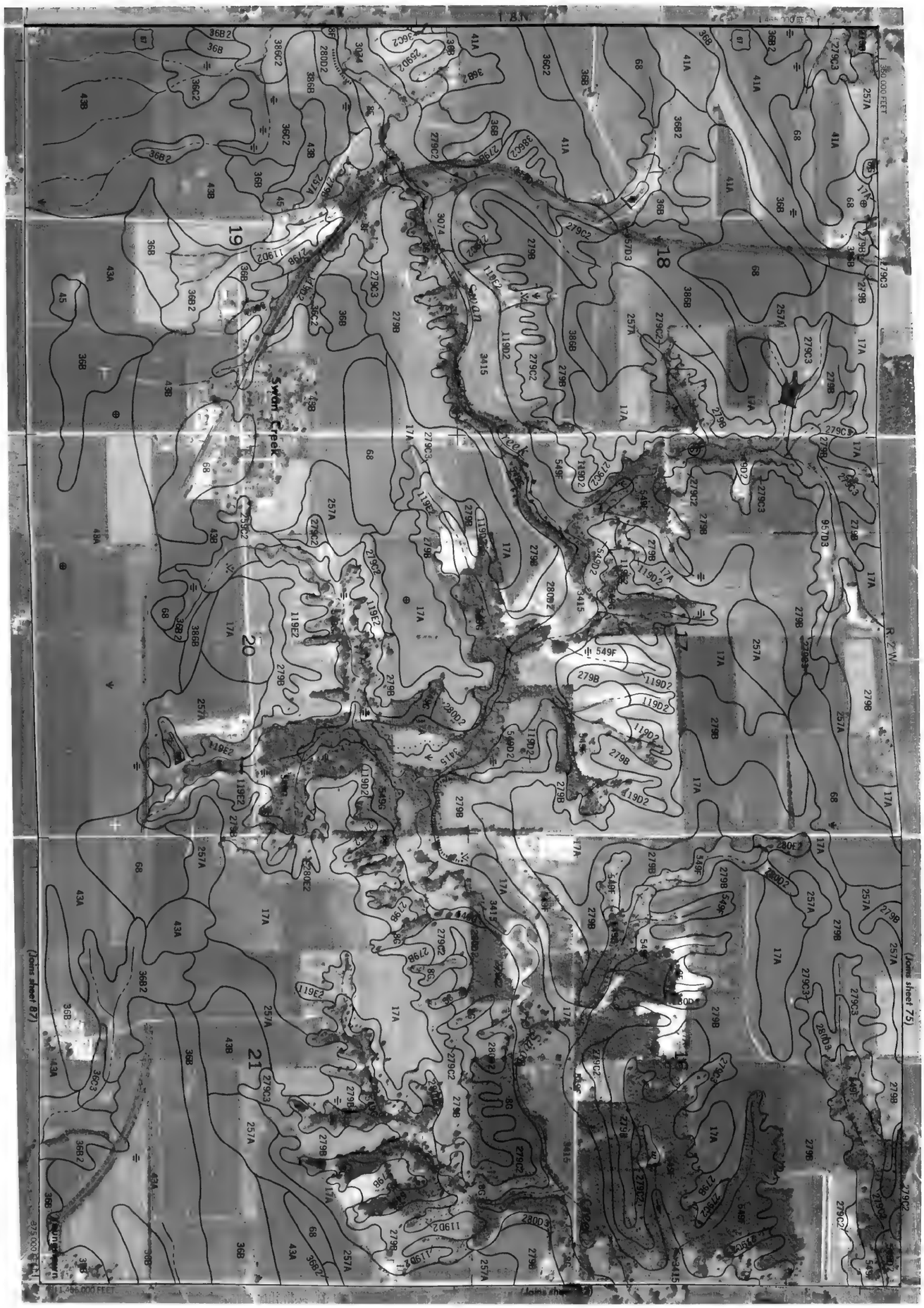
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 80

WARREN COUNTY, ILLINOIS NO. 80

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 81



1 Mile
5 000 4 000 3 000 2 000 1 000 0 5 000 Feet
Scale 1:15 840

N

81

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 81

82

N

1 Mile 5,000 Feet

Scale 1:15 840

(Joins sheet 76)

(Joins sheet 81)

(Joins sheet 88)

(Joins sheet 83)

R. 2 W.

T. 8 N.

390 000 FEET

380 000 FEET

Bluegstown

WARREN COUNTY, ILLINOIS NO. 82

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

This soil survey map was compiled by the U.S. Department of Agriculture. Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 83

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 84

WARREN COUNTY, ILLINOIS NO. 84

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 85

SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 85

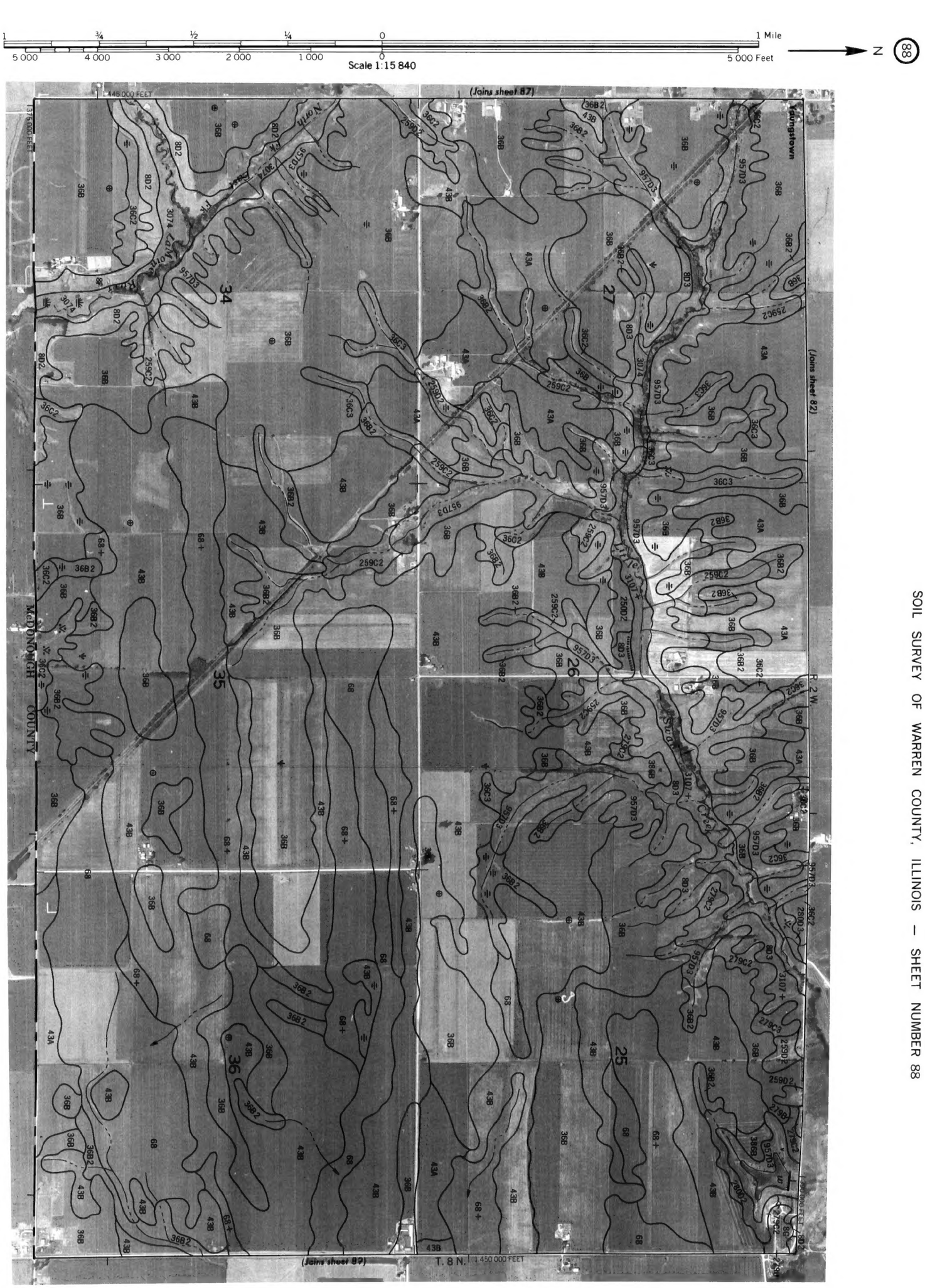
SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 86

WARREN COUNTY, ILLINOIS NO. 86

This soil survey map was compiled by the U.S Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 87



SOIL SURVEY OF WARREN COUNTY, ILLINOIS — SHEET NUMBER 88

WARREN COUNTY, ILLINOIS NO. 88

This soil survey map was compiled by the U.S. Department of Agriculture. Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

WARREN COUNTY, ILLINOIS NO. 89

89

N

1 Mile

5 000 Feet

Scale 1:15 840

1 395 000 FEET

1 450 000 FEET

1 455 000 FEET

405 000 FEET

R. 1 W.

T. 8 N.

(Joins sheet 83)

(Joins sheet 90)

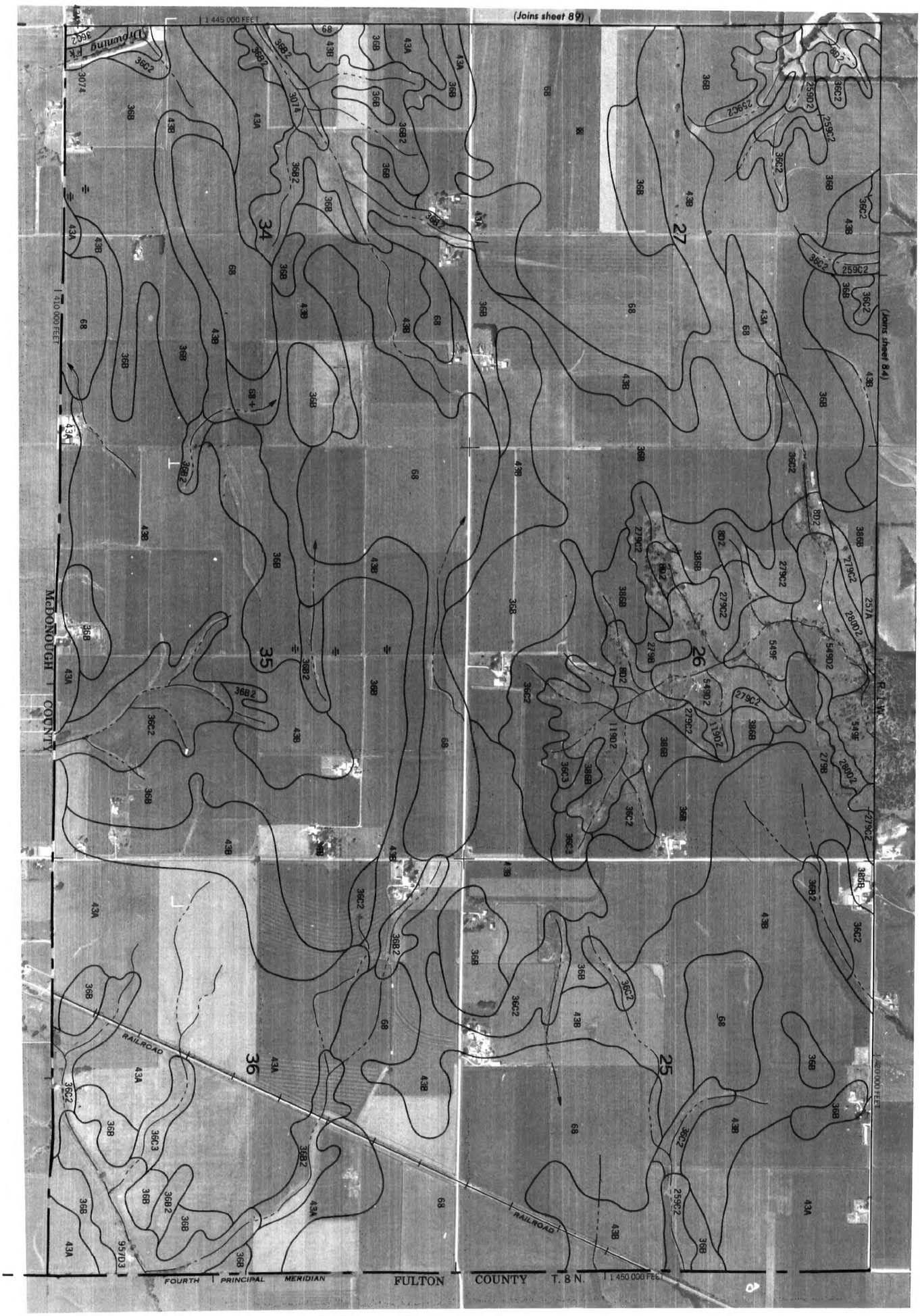
(Joins sheet 88)

McDONOUGH COUNTY

Drowning Fork

Drowning Fork

30 29 28 31 32 33



WARREN COUNTY, ILLINOIS NO. 90

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.